

PREFACE

Leaping to the attention of our current times are the terms ‘System’ and ‘Sustainability’. There are natural systems, man-made systems, and culturally derived systems, all vying for sustainability and some among them are precariously positioned to cause humanity’s concern. Thus a critical need of our times is Leadership for Sustainability of our complex and dynamic socio-ecological systems wherein we all exist as interconnected systems – i.e. as individuals, as groups and as organisations.

Our international conference is focused on throwing light on this need as our environment is changing at a faster pace than we are adapting to it. Thus, the clarion call is Leadership for Sustainability so that those systems which serve us can do so for generations to come.

As indicated by Stafford Beer in his book on “Designing Freedom” systems are dynamic and surviving. Indeed if they were not, they would not be there. Yet our culture pays scant regard to organisations, thinking that there are mere entities. Further, for effective organization of communities, man over time adopted language for communication, business for transaction, music for recreation, governance and politics for smooth functioning, technology for comfort and swiftness, ecopolicy for sustained green and healthy environment. Thus, the question in front of us is that is there a need to train good leaders oriented to sustain our systems for the human welfare for good?

The stalwarts in the domains viz., ‘systems’ and ‘sustainability’ are participating in the conference along with our own native participants, to propagate and impart the directions required for this ‘Leadership’.

Prof.S.Krupanidhi

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1. CAN LEADERSHIP FOR SUSTAINABLE SOCIO-ECOLOGICAL SYSTEMS BE ACHIEVED WITHOUT SYSTEMS THINKING EDUCATION AS THE FOUNDATION?

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The purpose of this talk is to officially link the conferences of the ISSS in Boulder, Colorado and LSSS in Vadlamudi, India through a focus on the importance of systems thinking knowledge of EVERYONE through collaboration in systems education to achieve the goals of both conferences. This focus is only one of the many mechanisms for enhancing future collaboration, but deals with a vision very close to myself, namely, to take systems science out to EVERYONE and to all areas of society where it can make a difference to the lives of people.

The themes, “Leadership for Sustainable Socio-Ecological Systems” and “Sustainable Futures”, are highly complex issues that cannot be solved anymore with traditional single discipline and linear thinking mindsets. The nature of complexity is very much determined by the unique interactions between economic factors, stage of development, technical solutions, environmental and agricultural practices within different cultural and political settings. This makes the two conferences in Colorado and India of particular interest – they provide an opportunity to learn lessons from each other towards finding systemic solutions to the (different) worlds in which we work and live.

We are often forced to take a technical view of the world. However, technical systems are only part of what makes our ever changing world complex. Each challenge, involve people with their own political agendas, motivation, different cultural backgrounds, economic mindsets and history. In fact, most of the world is socially complex.

We need a new practical understanding of change and how systems underlie the fundamentals of change. There is a need to learn to see the world systemically and interconnected and to describe systems using easy to grasp tools - always mindful that whatever learning material is available, it needs to comply with the needs of ‘EVERYONE’, regardless of people’s background, level of education or areas of interest. We need to learn taking responsible action that will lead to effective change and implementing change as a business process. Of greatest importance is the fact that we need to learn how to embrace complexity as an integral part of change, rather than running away from it.

Employers will increasingly require their employees to have the capacity to redesign in systems and sustainability terms. In other words, there is an increasing demand for society to move away from linear thinking that often leads to “quick fixes” that do not last, to a new way of thinking that is systems-based. Understanding the principles of interconnectedness,

feedback and leverage points in systems and appreciating the value of cross-sectoral/disciplinary and cross-cultural communication and collaboration are the only ways in which our societies will be able to find long lasting, sustainable solutions to the many problems we are all facing. Developing such an understanding in order to address complex economic and managerial challenges, requires a strong level of awareness of the value of knowledge on systems approaches and tools – not only for systems scientists, but for everyone. Systems scientists develop theories, concepts and tools, but in practice we need a “new way of thinking” that can develop from the contributions of scientists to the knowledge pool. This, in the first place has increased the demand for systems education. In other words, developing a knowledge of whole systems and how they work, interconnectedness between components of the system and how to use this knowledge to manage change has become essential for EVERYONE if we are serious about dealing with the complexities of a continuously changing world.

In this talk I will introduce one of the world’s first comprehensive “Systemic Change Management for EVERYONE” programs – “first”, because the focus is on “Systems Thinking for dealing with complexity” to serve as a foundation to follow-up educational programs to become a systemic change agent, change master or change entrepreneur. These are the people society requires to achieve sustainable futures and leadership in different socio-ecological systems.

The Evolutionary Learning Laboratory (ELLab) approach, developed as a web-based tool “Think2Impact” for dealing with complex issues, was used to develop the contents, nature of delivery, practical exercises, etc. of an effective systems course that will form the foundation of a “Systemic Change Management for EVERYONE” educational program. This course has been developed through collaboration between the Systemic Change Institute in Berlin, International Federation of Systems Research (IFSR), the ISSS, International Academy for Cybernetics and Systems Sciences (IACSYS) and SysPrac in Adelaide, Australia. The ELLab consists of seven steps, starting with the gathering and integration of the mental models of all stakeholders (academics, industry, businesses and government departments) who operate in different systems, followed by developing a model of the “bigger picture” to identify essential attributes and how these could be achieved through defining the nature of the contents of the course, how best to offer such a course online (implementation) and a reflection (through questionnaires, analysis and discussion) on the degree to which these attributes are being achieved. An example will be discussed how the reflection step of the first round of the cyclic process of implementation, reflection and adapting the course contents or modes of delivery, has revealed that participants have shifted their way of thinking significantly from limited understanding and linear thinking to more coherent and interconnected thinking. In this example, during the pre-learning phase one third of the trainees were inclined to jump to the solution (i.e. treating the symptoms and “quick fixes”). After completing the course nearly 80 percent of them mentioned the use of their new knowledge on systems-based approaches, highlighting the system component interactions, unintended consequences, leverage points and systemic interventions. There was a clear improvement of the knowledge on interconnected thinking and how to deal with complexity. Significant changes also occurred in their skill levels (capability to use easy to grasp system tools) and their aspirations (willingness and eagerness) to apply their learnings in their workplace. Based on the survey results and analyses, it could be concluded that systems thinking education can be regarded as the leverage or systemic intervention for being able to take action towards the advancement of leadership for complex sustainable socio-ecological systems.

Finally, recommendations will be made on how India could become part of the worldwide network of systems education through further cooperation between ISSS, the Systemic Change Institute in Berlin, the prestigious International Academy for Cybernetics and Systems Research (IACSYS), SysPrac in Australia and participatory organisations and individuals of the international conference on "Leadership for Sustainable Socio-Ecological Systems" (LSSS 2016).

2. MALIK ECOPOLICY—A CYBERNETICSIMULATIONPROGRAMFOR LEARNING ABOUTSYSTEMS THINKINGAND 'LEADERSHIP FORSUSTAINABILITY'

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Despite many efforts to deal with the various complex issues facing our societies, plans and problem solutions are seldom long lasting, because we, as individuals, and our leaders are most likely to fall into the trap of using traditional linear thinking. It is natural and easy, but does not usually deliver long-term solutions in the context of highly complex modern communities and societies. There is an urgent need for innovative ways of thinking and a fresh approach to dealing with the unprecedented and complex challenges facing our world. It is essential for current and future leaders and citizens to be prepared for system thinking to deal with complex problems in a systemic, integrated and collaborative fashion; working together to deal with issues holistically, rather than simplistically focusing on isolated features. A revolutionary educational tool (Ecopolicy) is used as the main mechanism to achieve this aim. Furthermore, Sensitivity Model (the 'engine' of Ecopolicy) is used as a system tool to address complex problems and achieve sustainable outcomes in a various areas, organisations, businesses, etc.

Keywords: system thinking; systems education; complexity; Ecopolicy simulation game; sustainable development; SensiMod; management; sustainability

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3. A WHOLE SYSTEMS APPROACH TO EDUCATION REDESIGN - A CASE STUDY ON THE NEED FOR INTER-GENERATIONAL PERSPECTIVES AND INCLUSION

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This study was commissioned by the Global Education Futures forum for presentation at its fourth International Conference in Moscow, Russia, from 29 February to 2 March 2016 (<http://edu2035.org/#program>). The objective was to conduct field research with a special focus on the vision of the future of education held by young people. This report presents some views and perspectives of my generation regarding what they want education to be like in the future. In northern California, my teachers Ms. B and Mr. Wahanikused the framework of questions and activities that my father and I developed to gather this kind of information by running a sort of “focus group” with my 10th Grade class and to find out what their views, perspective, opinions, ideas, hopes and concerns are regarding this theme. This group consisted of mainly 15 and 16 year olds, and there are around 40 students in my class. They had less than an hour to run the whole process, but everyone already knew each other really well so they could go quickly through the process, as described in this report.

A similar process was run with a group of young people in Buenos Aires, Argentina. Here I had to work with people whom I had never met before and who also didn't know each other at all. We had exactly 12 students from a variety of public and private schools with an age range from 12 to 17 years old. However, we had a total of three hours with them, so we could do an icebreaker and take our time to move through the whole thing.

In both cases (California and Argentina), the idea was to engage young people in a series of structured creative Future Thinking adventures that helped them “invent” what education (learning and teaching) should be like in the year 2035. The idea behind this is that educators and those involved in the systemic re-design of education systems might want to include this kind of data and these kind of perspectives in the work they are doing. I would like to present my findings at the ISSS and to see whether others think more of this kind of work should be done.

KeyWords: Education, Youth, Social Systems Design, Idealized Systems Design

4. LIVING VIRTUOUSLY AND WELL: ADDRESSING THE LOW CARBON CHALLENGE TO ADDRESS WELLBEING AND CLIMATE CHANGE THROUGH PARTICIPATORY DESIGN AND EDUCATION ON MITIGATION, GOVERNANCE AND ACCOUNTABILITY

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The impact of climate change has been underestimated and the way in which *built* capital is valued at the expense of *social and environmental* capital has resulted in development and urbanisation processes that threaten food, energy and water security. These issues were discussed and raised at a previous conference on sustainability hosted with UniversitasNasionale in 2015, Jakarta where I presented a plenary paper. This issue was also addressed by delegates from the West Java Provincial Government who attended a ten day leadership workshop at Flinders University. Workshops at the Ministry of Finance, Ministry of Religion and Ministry of Social Affairs in 2013 and 2014 have resulted in establishing the basis for this research. This research is in several stages and this is stage one in Indonesia. The objective is to develop a way to enhance the management of carbon footprints by participants. This paper discusses the:

- **Design and preparation for a participatory action research** project based on engagement with staff at UniversitasNasionale, Padjadjaran, Indonesian State Islamic University and West Java Provincial Council and Wirasoft, Sydney.
- **Processes to date that have involved developing a research consortium with universities and Wirasoft.** The participatory process supports the design of a Participatory action research program to be implemented in three stages across Depok (a highly urbanized area with a diverse population), Jatinaror, (an area that is becoming increasingly suburban) and Cimis (a food production area).

The fourfold aim of this PAR research in public policy and administration is to:

- **Develop and pilot processes for public education and engagement** to address the rights and responsibilities of ecological citizens through participatory public education. The approach to the research will be to pilot the engagement software and to test the understanding that people have of social, economic and environmental challenges before and after using the software.
- **Work with people** to find local solutions and to explore what works, why and how and what does not work why and how. It will do so by exploring the following hypothesis: The greater the level of public participation a) the greater the understanding of UN Development Goals, b) the greater the personal application of the goals.
- **Address the low carbon challenge** by finding ways to re-generate the way we live in cities and to be mindful that the United Nations Sustainability Development Goals do

not go far enough to prevent food, energy and water insecurity in unliveable environments. It addresses considers food, energy and water security by enabling people to engage in local governance at the local level.

□ **Extend** the previously funded research by the Local Government Association, entitled: ‘Decision Making Software to address mitigation and adaptation to climate change’ (Ethics Protocol 5262).^[4]

Thus the research will:

□ Deepen our understanding of how people perceive local climate challenges and experiences

□ Explore the social influences habits and a range of behaviours that potentially shape consumption

□ Test the kinds of face-to-face and digital public engagement that could encourage people to explore ways to live simply and well. The research is low risk and the data will be collected by Assoc. Prof Janet McIntyre and co-researchers. The research will be conducted through focus groups, interviews hosted via the participating organisations and a web based survey.

Keywords: low carbon living, footprint, participatory design, accountability

5. USING KNOWLEDGE MANAGEMENT TO FIGHT THE NATION'S ENEMIES

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Corruption is the enemy of the nation, as corruption is a very powerful political tool to destroy the unity of a nation by causing it to become weak. With political corruption, a country will be easily swayed because the gap between the rich and poor within a country is gradually widened. Rich people become scarce and poor people increase. As expressed by the 1st Indonesian's president Soekarno, "MY STRUGGLE WAS MUCH EASIER BECAUSE I ONLY HAD TO DRIVE AWAY THE INVADERS FROM OUR COUNTRY WHILE YOURS ARE DIFFICULT, AS YOU HAVE TO FIGHT AGAINST YOUR OWN PEOPLE". What he meant by "difficult" is that it is difficult to eradicate corruption, because combating corruption involves fighting its own citizens.

As stated by Sun Zi (544-470 BC), a philosopher and military expert in China in his book of military philosophy, titled 'Sun Zi Bing Fa', "If you know your enemy and yourself, you will not be defeated in any battle".

Only with the knowledge and the awareness of the nation (or Mental Revolution as stated by Jokowi, the president of Indonesia), we can avoid ourselves from the grip and greed of other nations that use political corruption as a tool to weaken our country. To raise knowledge and awareness of a nation, the nation needs a concept that can systematically collect and share knowledge effectively and thoroughly. The concept is known as Knowledge Management (KM).

As written in the KM WORLD website by Michael Koenig, professor of computer science at the University of Long Island, KM is a concept and term that appeared about two decades ago, roughly in 1990. This concept can be said that the goal of KM is organizing information and knowledge of the organization as a whole.

Davenport (1994) stated: "KM is the process of capturing, distributing and using knowledge effectively". Several years later, Gartner Group created a new definition, which is probably the most cited: "KM is a discipline that promotes an integrated approach to identifying, capturing, evaluating, retrieving, and sharing all the information assets of an enterprise. These assets include databases, documents, policies, procedures, and expertise in turning data into information, information into knowledge and knowledge into policy".

In essence, to prevail in this 'difficult' battle against corruption, we must know our enemy and ourselves. For that we can use KM to systematically collect and share knowledge effectively and holistically to improve the knowledge and consciousness of the nation as a whole.

6. EXPLORING CONSTITUTIONAL MAKING & CONTENT FROM A SYSTEMS THINKING & SUSTAINABILITY PERSPECTIVE

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Currently we have crisis plagued and recent war-torn countries (e.g. Iceland and Sri Lanka respectively) actively pursuing the political choice of designing a fresh constitution rather than amending their constitution - the supreme law of the land.

This gives us an opportunity to think and design constitutions with a focus on systems sustainability (of the country), and not just think of it (constitution) as a legal instrument. Complexity, dynamics and diversity are hall marks of national constitutions which prompts one to enquire how can systems thinking help us - both in the way the constitution is designed, and the interrelationship of the constitution's content itself.

Thus, I want to introduce to you the organizational cybernetic principles we are come to learn from research into neuro-physiology in terms of the way our human body governs itself and upholds its identity.

These organizational cybernetic principles (proposed by Ashby, McCulloch, Beer, Vester) will then be considered in the systemic context of the need to have a process for building a constitution, for designing the content of the constitution, and for evaluating the proposed constitution as a whole, rather than being 'subject silo' confirmed, as is the usual practice.

7. SUSTAINABLE AND RENEWABLE SYSTEMS: WHAT CAN WE LEARN FROM THE LIVING CELL?

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We, the living, all do something astonishing that no non-living thing can do. Unlike, say, a car, which needs you or a mechanic to replace or repair its parts, you can make all your parts by yourself. Whether we are bacterial, plant or animal, every single part in each of our cells is replaced or repaired, not from without but from within: cells are biochemical factories that uninterruptedly and autonomously fabricate and maintain themselves. It is this that sets us apart from the non-living world. Biochemistry and systems biology have given us a deep understanding of how the bits in a living organism form a complex network of interactive and productive processes that form the functional organisation of a near-perfect, self-producing sustainable system, a system that can serve as an ideal model for our human systems and organisations.

Can we learn from the living cell how to construct our systems to be sustainable and renewable? Yes, but we must first understand what the act of self-fabrication entails? The theoretical biologist Robert Rosen showed that what he called closure to efficient causation is a necessary condition and used category theory to develop a model of a self-fabricating system. In this talk I discuss a new model of the self-fabricating cell that incorporates four features that are generally accepted as necessary for life: a functional organisation that ensures self-fabrication, a molecular form of self-representation that can be copied, an organic coding system that decodes the self-representation into cell components, and the ability to create an internal environment that allows the cell components to become functional.

8. THE ENTREPRENEUR OF INNOVATIVE ORGANIZATIONS: AN ACTION RESEARCH APPROACH APPLICATION.

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The focus of this paper is on the application of Action Research Approaches in the design of organizations. It is a theoretical and practical approach that was developed by the author through a participatory methodology and documented in her book "The Entrepreneur of Innovative Organizations".

The book promotes the creation of business in a systemic way, thereby allowing the knowledge of the future organization to emerge through a permanent and interactive learning process. Experience with different kinds of organizations striving to become more innovative enhanced the action research approach by making it more dynamic. The process is concerned with entrepreneurial action and reflection in an organizational and environmental setting. As a consequence, an evolutionary, adaptive, and entrepreneurial system emerges.

This systemic methodology creates a collective learning environment conducive for developing products, services, and processes in a creative, methodical, and effective way. The process also enhances the manager's ability to innovate, thus increasing organizational competitiveness. These advantages will help businesses navigate a global environment which demands new human talent and places emphasis on creativity and innovation. Entrepreneurs within communities are encouraged to discuss organizational incubation through a series of questions included in each chapter of the book. The answers to these questions will promote beneficial discussions that emerge in a dynamic entrepreneurial system.

The practical network of interconnected organizations as proposed in the book produces an effective understanding of change within a complex business ecosystem in both public and private organizations. An analysis of several case studies demonstrates the importance of organizational background, structure and sector, and their entrepreneurs in designing sustainable organizations. Understanding the principles of interconnectedness and the feedback generated by different types of organizations will promote the growth of innovative business communities. Creating entrepreneurs of innovative organizations will help address important matters such as unemployment and the survival of future organizations.

9. ADDRESSING THE SUSTAINABILITY OF MINOR LANGUAGES - WHY AND HOW

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Many think of sustainability in terms of nature (water, land, fossil fuels), but there is the socio-economic dimension which deserves attention too.

The aim of our paper is to understand the relevance of written and spoken languages, which is intrinsic to communication and at times is a hallmark of the identity of group/s. This opens the question to language differentiation, like major and minor languages (in terms of the number of users). We then consider how the viability of minor languages, particularly its written script and vocabulary, is to be sustained in the 21st century.

In recent decades the perceived threat associated with language has been a major contributor to social disharmony (Canada – French/English, Spain – Spanish/Basque), sometimes escalating to warfare (Sri Lanka – Sinhala/Tamil/English). Reflecting on the Sri Lankan experience from a socio-cultural-economic point of view, we can see how a single variable like language can be diversely employed – in education, employment, mercantile and government, administration, social conversation.

Today from a socio-economic point of view with computers becoming the equivalent of pen/pencil, language scripts which don't reach the world of computers are traversing the path to museums. At times it is facets of a language's alphabet, rather than the whole script, that is being obsoleted in the world of computing.

Using the example of cross indexing of big data in anti-corruption drives, we explore in depth why Sinhala and Tamil legacy scripts need to be sustainable. Based on OCR infrastructure as needed for legacy documentation, we explore what is required for scripts to be viable across multiple computer platforms.

Keywords: Minor Languages, Sustainability, Viability, Purpose, Why How Computing, OCR (optical character recognition), Anti-Corruption, Big Data cross referencing, Archiving

10. LEADERSHIP IN HUMAN-CENTERED DEVELOPMENT

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The world needs a new human-centered model for development that is inclusive, integrated and sustainable. Its central aim must be to promote higher levels of welfare and well-being for all human beings in both present and future generations. This requires an approach that guarantees employment opportunities for all job-seekers; for in a market economy, gainful employment is the essential means of promoting human welfare. It should be based on policies that shift the emphasis from investment in capital and energy-intensive technologies to investment in people and social systems, human capital and social capital. This requires changes in the governance of financial markets to redirect resources to investment in the real economy, changes in the pricing of non-renewable resources to reflect their true value, and changes in taxation to shift the bias from capital and labor. It needs to be supported by a world-class educational system that promotes entrepreneurship, independent thinking, creativity, universal values, individuality and leadership. This requires radical change in the pedagogy and content of education and vocational training at all levels. The approach must be founded on a perspective that views business, economy, science, technology, education, governance, law, communication and transportation as subsystems of society and integrates them to maximize freedom of choice, innovation, social harmony and stability. This requires formulation of a transdisciplinary theoretical framework for business management, economy and other fields of social science. India has the potential to develop such a model as a leader of global socio-ecological evolution. A great beginning can be made by immediate implementation of a comprehensive program to double the productivity of agricultural land, water and energy resources, which has the potential to double food production, stimulate entrepreneurship for rapid development of downstream industries and value-added services, improve nutrition, and generate full employment in India.

11. SYSTEMS BIOLOGY OF HOST-PATHOGEN INTERACTIONS

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Traditional biological research on host-pathogen interaction focuses on a small set of host and pathogen components. Indeed, during pathogen-host co-evolution, hosts have developed an armory of complex defense mechanisms to eliminate the pathogens. Conversely, pathogens have evolved strategies, in part driven by molecular interactions, to evade host cellular defense and sustain their control over the cellular machinery. Therefore, the outcome of infection is largely determined by the cellular response comprising a multitude of molecular events. The complexity and dynamism of these processes make it essential to adopt systems approaches to study host-pathogen biology. The breakthroughs in genomics, transcriptomics, proteomics and metabolomics have enabled the investigation of host-pathogen interactions at a multidimensional and systems level. We have studied the host-pathogen interactions for two pathogens, Mycobacterium tuberculosis and Dengue virus, at the systems level.

Several studies of the host transcriptome in response to M.tb are increasingly being reported in literature in recent years. Interaction networks based on experimentally known protein-protein interactions (PPIs) and theoretically predicted interactions are available for several organisms including different human cell types. We have applied graph theoretical methods to reconstruct weighted directed networks by integrating ‘omics’ data from tuberculosis patients available in literature with a curated large scale model and identify ‘highest activity’ paths in the cell during M.tb infection [1].

Dengue, an emerging infectious disease, is presently the most common arboviral disease globally. In order to be able to design novel vaccine and anti-viral strategies against dengue viral diseases one needs to understand the pathogenesis caused during dengue infection. We have developed a Dengue Human protein Interaction database called “DenHunt” which serves as a freely accessible, continuously updated, and comprehensive resource for the dengue research community [2]. As expected, many proteins of the dengue-interactome are involved in cellular signaling, immune system, vesicular trafficking and metabolic pathways. We also show that seven percent of the Dengue – Human Interactome are involved in the pathogenesis of other infectious and non-infectious diseases and thus represent a powerful resource to identify broad-spectrum drugs. Subsets of proteins of the Dengue – Human Interactome are already reported to be targeted by FDA-approved drugs to treat other diseases. These drugs could be tested for their anti-dengue viral effect and could be used in drug repositioning strategies and thereby facilitate a faster computer to bench studies and reduce the risk and cost of drug discovery approaches to diseases caused by dengue virus.

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12. HYDROPONICS IS A SUSTAINABLE SUPPLEMENTATION FOR GREEN ECONOMY

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The carbon resources for nutrition are conventionally produced and cultivated on a regular seasonal basis. To meet the growing demand and low carbon footprint due to density of population, habitat crunch, climatic crisis etc., we are moving forward in creating a green and sustainable economy. There are many different ways that one can make the right steps in being a lead example on how to improve global carbon footprint sustainability. In this context hydroponics is considered as a supplementation to agriculture. The concept of hydroponics invariably supplements to meet the challenges of low carbon fingerprinting during the span of water scarcity due to frequent droughts and declining land availability for farming and hence government agencies & NGO’s are promoting hydroponics for growing fodder, leafy vegetables, flowers etc. Grown without soil and using minimal water and land, farmers are also turning to this technique as the fodder produced through hydroponics is more nutritional and least pest infected than the regular fodder. There is a minimization of water consumption and it would be up to 75% in the hydroponics system.

Our attempt to study the potential of growing mint (*Menthasachalinensis*), green chili plant, money plant (*Epipremnummaureum*), Dieffenbachia (croton), Coleus, table rose and elephant ear plant (Colocasia), lily and golden money plant supplemented with nutrients viz. Ca (300 ppm), Mg (400 ppm), NPK (260 ppm), boric acid (300 ppm), Zn (400 ppm) and S (300 ppm), pH 6.5 and E.C 1.10 ds m⁻¹ in a 500 L water tank circulated through PVC tubes is to experiment the conservation of water. The prototype experiment was laid out in recovery drip system, wherein the nutrient water is kept in circulation. Each sub plot in PVC pipe studded with coir peat. Different varieties of plants were selected for growth in hydroponics. The values of highest plant length in mint (19 to 45cm), green chili (17 to 21cm), money plant (10 to 30 cm), Dieffenbachia (40 to 50 cm), coleus (10 to 20 cm), table rose (14 to 38 cm), Colocasia (7 to 23 cm), lily (18 to 33 cm), and golden money plant (25 cm) were obtained in 2-4 weeks after transplanting (WAT). The highest number of shoots were obtained in Dieffenbachia, mint, coleus, chili plant, table top and croton grown in coir peat under recovery drip hydroponics systems and interestingly plants’ roots take up the only required amount of water despite being immersed in water flowing in PVC tubes of hydroponic system and leave the rest in the reservoir for later use. The construction of a hydroponic system requires an initial investment, plan, net shade and care. Better the yield will be, if approached as it needs. It is recommended that this hydroponics system could be adopted as a step to produce the vegetable crops, ornamental flowers, fodder and medicinal plants to meet the global demand and thereby it would supplement to support the socio-ecological systems.

13. CONSERVATION OF MOLLUSCAN SPECIES DIVERSITY ENCOMPASSES ECOLOGICAL SUSTAINABILITY

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The planet Earth is an amazing habitat for living organisms and every organism as an inhabitant has a defined role, doesn’t matter the value, longevity and size of the organism. Cycling of carbon between flora and fauna is one among several other feedback systems that shows the beautiful architecture of the societies inhabited on earth. Carbon fingerprinting is recycled in varied forms among these flora and fauna; ultimately made available for livestock and humans. In this context, it is emphasized that conservation of biodiversity takes care of ecological sustainability.

In the present article, our interest on gastropods, a family of snails and slugs classified under the Phylum Mollusca, is primarily due to its large assemblage in freshwater and marine environments in addition to terrestrial habitat. Phylum Mollusca constitutes around 85,000 extant species. They are snails, octopuses, squid, clams, scallops, oysters, and chitons. There are also 35,000 extinct species and interestingly 5070 species of molluscs are reported from Indian subcontinent. Molluscs are diverse in terms of their species abundance and also encompass a range of morphologies and ecological niches. They adapt to diverse habitats that range from the highest alpine regions to the innermost sea vents and further varied life styles such as trophic niches encompassing predatory, herbivorous, scavenging, detritivorous, filter-feeding and also symbiotic photo-and chemoautotrophs predominantly utilizing carbon source through its cellulase. In addition, molluscs due to their inherent capacity to build hard shells sequester atmospheric carbon and deposit in their shells as calcium carbonates and thus contributing to balance the climate and environmental temperature.

In our experimentation to analyze molecular affinities among endemic gastropod species, we have chosen giant African snail (*Achatinafulica*), Indian apple snail (*Pilaglobosa*), *Pilavirens*, *Bellamayabengalensis* and the slug, (*Lavicaulisalte*) to evaluate their kinship and habitat preference. Our results indicate a strong support for the monophyly of achatinoid taxa and further support the radiation of conspecifics from other regions of the Indian subcontinent. The partial nucleotide sequence of COI gene indicates that there is a strong support of bootstrap values for two groups’ viz., Viviparoidea and Ampullarioidea suggesting that each of the two is distinctly monophyletic preferring its own niche.

14. SOCIO-ECONOMIC UPLIFTMENT OF COASTAL RURAL PEOPLE THROUGH SUSTAINABLE UTILIZATION OF SEaweEDS

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Seaweeds are benthic marine macrophytes occurring in inter tidal and sub-tidal areas of the seas and oceans. In India they are being collected manually by the local fisher folk and used mostly for the manufacture of phytochemicals viz., agar and alginate. Seaweed resources are estimated and they are found to vary from 6, 77,309 to 6, 77,759 tons (fresh) and represent only 3.4% World natural resources.. Total seaweed collections of agarophytes and alginophytes ranged from 1173 to 6417 tons (dry) during 1978-79 to 2002-03 for feeding the phycocolloid industries. Indian phycocolloid (agar and alginate) production was 430 tons and forms only 2% the world phycocolloid production during 2001. Around 5000 women in southeastern India are exclusively dependent on seaweed related activities for their livelihood each earning Rs 4500/- to 5250/-per month. Seaweed cultivation has been introduced in 47 countries worldwide and the seaweeds being cultivated include *Laminaria japonica* and *Undariapinnatifida* (brown) , *Porphyra*, *Euclima*, *Kappaphycus* and *Gracilaria* (red) and *Monostroma* and *Enteromorpha* (green) and of these seaweeds , *Kappaphycus* plays a major role because of the application of its phycocolloid, *kappa* carrageenan in pharmaceutical and food industries , as is evident of its recent production of 183000 tons dry through cultivation alone. Major carrageenan seaweed producing countries include Indonesia (60.5%), Philippines (31.9%), Malaysia (3.7%), United Republic of Tanzania (2.3%), China (1.1%) and Indian contribution is only 4240 tons wet. The commercial cultivation of this seaweed in India has picked up around 2006 after the introduction of Self Help Groups (SHGs) by Aquaculture Foundation of India (AFI) although its cultivation has been introduced by Dr P.V.SubbaRao, CSMCRI-MARS (CSIR) during the last quarter of 1995 near Pamban bridge (Thonithurai, Mandapam, Tamilnadu) in Gulf of Mannar waters of Bay of Bengal, Southeast coast of India . Among the economically viable cultivation technologies for *Gelidiella acerosa*, *Gracilaria edulis*, *G.dura* , *Enteromorpha compressa* and *Kappaphycus Alvarezii* , only *Kappaphycus Alvarezii* cultivation has been accepted by the fisher folk , since it yields lucrative income , each person earning Rs 15000/- to 17000/- per month. Judicious management of seaweed resources coupled with following the scrupulously laid harvesting schedule along with promoting cultivation of economic seaweeds definitely helps the poverty stricken coastal people to improve their socio-economic standards. Moreover this will lead to establish seaweed based industries generating employment as is seen in Tamil Nadu.

15. MORE WATERFOR IRRIGATION IN SEMI-ARID REGIONS – AN INNOVATIVE APPROACH FOR SUSTAINABLE LIVELIHOOD

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Rural India predominantly subsists on agriculture. Many regions across the country face shortage of irrigation water due to erratic or deficient rainfall. Available water is generally only sufficient for domestic use. As a result, farmers often have to purchase water for irrigation. Based on a literature and field survey of wastewater treatment systems in India and a detailed study of the construction and maintenance of a sewage treatment plant in PrasanthiNilayamtownship, we developed a model for effective reuse of treated wastewater in semi-arid regions. MORE WATER – a **MO**del for **RE**structuring **WA**stewater **T**reatment systems to make **E**ffluent **R**eusable – has the potential to bridge the gap between surplus domestic wastewater and shortage of irrigation water in semi-arid regions. MORE WATER describes how it would be profitable for organizations to construct decentralized sewage treatment plants for agrarian communities in rural areas and make available reusable effluent at a lower cost than what is being currently incurred for purchase of irrigation water; thereby making livelihood sustainable. To demonstrate practicability of this sustainable model, we have carried out an assessment of influent and effluent of the sewage treatment plant at PrasanthiNilayam on the basis of parameters that would serve as an indicator of water quality. This model is already being implemented in the PrasanthiNilayamtownship by effectively utilizing treated wastewater from the sewage treatment plant for maintenance of lawns.

16. VEDIC SCIENCES AND SUSTAINABILITY

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The word Veda is originated from the Sanskrit word “VID” which means ‘that which educates’, inferring Veda to be the knowledge source. These Vedas are believed to be the oldest manuscripts and we have four of them and each are classified based on their content. The essence of Vedas are practised in daily life either as tradition and culture. These Vedas are preserved by practising and memorizing them for generations in form of slokas and by very recital of these, we are said to attain spirituality. There is not only the spiritual but also materialistic dimensions for these Vedas. Each sloka we recite in our daily life can be decoded and arrive at some process technique or product description or medicinal properties or mathematical equation or astronomical references. This facet of Vedas was learnt in Gurukul education system but this system was ruined in colonization of British.

It is also less debated that Indians have mastered the science and technologies and this is quite evident from Delhi Iron Pillar, Tippu Sultan Sword, Konark Temple, Astrological sciences and many others. These were included into common man life in the way of customs or traditions. The best example is application of turmeric powder by women. Turmeric is anti-bacterial and anti- microbial and this was proved scientifically by many researchers. The other good example is usage of Copper vessels for storage of water and by doing this the bacteria in water was killed making the water potable.

The present work is aimed to decode these Vedas or ancient scriptures into discernible scientific output and prove them using present scientific equipments.

17. YOGA FOR HEALTHY LIFESTYLE

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The art of yoga has been benefiting people for centuries and this ancient Indian discipline has gained immense popularity around the world. Yoga means union of the mind, body and spirit with the Divine and while this refers to a certain state of consciousness both individual and Universal, it is also a method to help one reach that goal, attain inner peace and deal with life’s problem in a healthy and calm manner.

Improved lifestyle through regular practice of yoga, getting oneself adapted to a life of simple living and high thinking. It includes 5 points of yoga viz.,

Five Points of Yoga are:

1. Proper Exercise (Asanas)
2. Proper Breathing (Pranayama)
3. Proper Relaxation
4. Proper Diet
5. Positive Thinking (Vedanta) and Meditation (Dhyana)

Designed by Swami Vishnudevananda, one of the pioneer teachers in the field of Hatha Yoga, and incorporated into modern style of living so as to make healthier and peaceful.

In an attempt to make Yoga a way of life, we are persistent in spreading these precious teachings to everyone.

18. TREATMENT OF TEXTILE DYEING INDUSTRY EFFLUENT USING COAGULATION TECHNIQUE

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Dyes are coloring compounds being extensively used in textile industries and the indiscriminate disposal of dye wastewater poses one of the major problems on the environment. This effluent contains a variety of contaminants viz. nature of acidic, caustic, dissolved solids and toxic compounds. The micro toxins are developed due to coloring agents by forming chelating under suitable chemical environment. Dyes usually have complex aromatic molecular structures which make them more stable and difficult to biodegradable. Furthermore, many dyes are toxic to some micro organisms and may cause direct destruction or inhibition of their catalytic capabilities. Textile industries use dyes and pigments to color their products they are more than one lakh commercially available dyes with over 735 tons of dyes stuff are produced annually. Many types of dyes represent acute problems to ecological system as they considered toxic and have carcinogenic properties, which make the water inhibitory to aquatic life. The objective of the present work is to investigate the effectiveness of chemical treatment on removal of color of simulated acid dye solutions. Three dye stuffs belonging to acid group were employed and batch tests were conducted with three coagulants (Calcium hydroxide, Ferric sulphate and Aluminium chloride) to access feasibility and also to study the optimum values for coagulant dosage, RPM, pH and time. The study clearly indicates that effluent-1 responds effectively to ferric sulphate, effluent-2 responds effectively to aluminium chloride and effluent-3 is moderately responded to calcium hydroxide.

Keywords: Coagulation, Dye effluent, Dosage, RPM, pH, Time

19. BIOHYDROGEN PRODUCTION THROUGH ANAEROBIC DIGESTION OF SUGAR MILL WASTE

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Food processing waste water contains of biodegradable organic matter, biogas hydrogen content varies with the operational conditions of an anaerobic digester and may be useful control parameter, experiments were carried out on a laboratory scale UASB reactor fed with a press mud step overload produced a sharp peak in biogas hydrogen level. Up flow anaerobic sludge blanket reactor was investigated for the treatment of low biodegradable composite waste water, which was complex in nature and low biodegradability with concentrations of sulphate and total dissolved inorganic solids after inoculating with slaughterhouse waste treating anaerobic sludge, the reactor showed rapid startup phase. The pH was maintained at the range of 5.5-6.0 to produce maximum hydrogen. The UASB operated at the ambient temperature with 30 hrs HRT. The COD reduction of 1664 mg/L from 23400 mg/L. VFA reduction of 11700 mg/L from 23400 mg/L. Alkalinity reduction was to 15860 mg/L from 22204 mg/L. The consistent gas yield was achieved after 7-14 days from start up period to tune around 1200 ml/day. At steady state conditions the reactor resulted in 62% of cod/m³-d. the experimental data demonstrated the applicability of UASB system for treating composite chemical waste water with low biodegradable nature, introduction of appreciate inoculation to the reactor during startup showed the effective biological treatment of composite wastewater and non-accumulation of concentration in the reactor with the generation of biogas.

20. BIODIVERSITY IS A BIO-INDICATOR OF CLEAN ENVIRONMENT

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At least 40 % of the world’s economy and 80 % of the need of the poor are derived from biological resources. In addition to the richer diversity of life, greater opportunity for medical discoveries, economic development and adaptive responses to such new a challenges as climate change.

One of the reasons of biodiversity is important because it helps to keep the environment in a natural balance. An ecosystem which is species-rich is more resilient and adaptable to external stress than one in which the range of species is limited. In a system where species are limited, the loss or temporary reduction of any one could disrupt a complex food chain with serious effects on other species in that same system. Once biodiversity is sufficient, if one nutrient cycling path is affected another pathway can function and the ecosystem-and the biological species it supports-can survive.

Biodiversity offers many Natural services such as Ecosystem services, Water conservation, Soils formation and protection, Nutrient storage and recycling, Pollution breakdown and absorption, Contribution to climate stability, Maintenance of ecosystems, Recovery from unpredictable events, Biological resources, such as Food, Medicinal resources and pharmaceutical drugs, Wood products, Ornamental plants, Breeding stocks, population reservoirs, Future resources, Diversity in genes, species and ecosystems, Social benefits, such as Research, education and monitoring, Recreation and tourism, Cultural values, Building materials, Fuel, Paper product, Fiber (clothing, textile), Industrial product (waxes, rubber, oils), Regulating global process such as atmosphere, climate and soil conservation, Pollination and seed dispersal, Control of agricultural pests, Genetic library.

Biodiversity may also define as “Biodiversity is an integral part of the ecosystem and have an importance in eco-balance for animal welfare” a new definition suggested in the present situation. In the last 50 years life has changed rapidly all over the world. This loss of biodiversity as a result of anthropogenic activities has become a central preoccupation among natural scientists, and many social scientists as well. One of the most important roles of the biodiversity may be as bio-indicator of clean and healthy environment need to discuss by researchers.

Keywords: biodiversity, environment, food chain, ecosystem, atmosphere, bio-indicator

21. DIAGNOSIS OF CHRONIC KIDNEY DISEASE USING RANDOM FOREST CLASSIFICATION TECHNIQUES

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Diagnosing a disease is a complicated task in many existing medical expert systems. Diagnosing a disease is based on the patient symptoms and other details that are given as input to the system. Several levels of uncertainty are involved in medical diagnosis. Data mining is a dominant research area to diagnose the medical data sets. Random forest is the classification algorithm used to diagnose chronic kidney disease. UCI is a Machine learning Repository which maintains a large collection of medical datasets. Chronic kidney disease is one of the dataset used for the proposed model. The proposed work develops an expert system used to diagnose chronic kidney disease.

Keywords: Data mining, Classification, Random Forest Classification

22. COMPARATIVE STUDY ON K-MEANS AND EM CLUSTERING ALGORITHMS IN HADOOP CLUSTER USING MAP-REDUCE

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HADOOP is an open source software framework written in Java and it stores the large amount of data in terabytes to petabytes. It uses the Map-Reduce for divide the large data into small chunks. This paper focuses on K-Means algorithm with Expectation maximization clustering algorithm using Map-Reduce in Hadoop. Experiments were conducted on K-Means clustering algorithm and Expectation maximization (EM) clustering algorithm. Experimental results shows that K-means clustering algorithm takes less time for execution compared with EM clustering algorithm, but EM clustering algorithm gives more accuracy than K-Means clustering algorithm.

Keywords— Hadoop, Map-reduce, EM clustering, k-means.

23. ASSIMILATING INTERNET OF THINGS AND CLOUD COMPUTING: ISSUES AND FEASIBLE SOLUTIONS

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In the present era most of the devices are connected to Internet. In internet of things (IOT) the word thing could be any communicational or non communicational device from a mobile phone to a street light. IOT is not a single technology, it’s a concept in which most new things are connected and the enormous data produced by them not only creates information it can also be used to create knowledge and wisdom. On the other hand Cloud computing has high speed Internet connection and the advantages of the almost unlimited storage and computing power compared with the traditional computing model. By integrating IOT and cloud computing, in addition to have the privilege of virtual resources utilization and storage capacity it is possible to create more usefulness from the data generated by IoT’s and develop smart applications for the users such as smart cities, smart home, smart building, smart energy etc; In this survey paper a brief review of how the Internet of things (IOT) can be integrated with cloud computing is discussed. Many papers are available that gives the survey of these two topics separately. This paper aims to give details of: the need for merging these two technologies, its applications, various challenges that result, the solutions proposed to those challenges and future directions.

24. INTERNET OF THINGS: A LITERATURE REVIEW

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Most people today have at least heard the term “Internet of Things (*IoT*)” and have a hazy understanding of what it means. Internet of Things (*IoT*) includes anything and everything that is connected to the internet and able to communicate and share information with other “smart” devices. Sometimes this concept is referred to as “M2M”—“machine-to-machine” communication. The internet began in the late 1960s as a link between a handful of university computer centers. In the 1970s and 1980s, the use of the internet was dominated by e-mail and file transfer, and the number of users was counted in thousands. In the 1990s, web browsing became dominant and users were denominated in millions. The internet as we know it today will radically change over the next decade. Just as various weather channels on television employ predictive graphics of what the weather patterns will be in the coming days and weeks, analysis of data from the internet of things will give us more concise predictions of what we will like, what we will need, and what we will do. It’s still early in the game. There are three main contributions of this paper: (1) Highlights the role of Internet of Things in the 21st century; (2) presents literature reviews to verify that the system performance is remarkable; (3) Identification of gaps that helps researchers for further scope of the study.

Keywords: Communication, Internet, Information, Internet of Things, Performance

25. A STUDY ON SECURITY AND PRIVACY ISSUES ON IOT

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Internet of Things is the interconnection of exclusively specialized embedded computing devices within the existing Internet infrastructure. IoT is internet connectivity of smart objects and embedded system other than mobile phones which can be connected with external hardware and Mobiles, Tablets, Laptops and PCs are remote control/access center of IoT. A Smart Object is an object that can describe its own possible interactions. In this paper we discuss about security and privacy issues on IoT.

First section explains the concept of security on IoT, the classification of privacy issues and to overcome that the IoT becomes reality.

26. SCHOOLS RECOMMENDATION SYSTEM

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Education is very important factor for every countries growth. Education is very important for counties like India. India is having more than 110 crore people. From that more than 16 crore people are joining to the schools. In India, every town, city is having plenty of schools. Choosing school provides best education is very difficult for the parents. In addition to education schools parents also expecting good class rooms, Information and Communication Technology enabled teaching, smart boards, and a good play ground, sports facilities also very import factors for the parent to choose school. From this huge number of schools choosing an appropriate school which meets the requirements of the parent is very difficult. It can be achieved by having an app or any system. This process is very difficult for the parents they move to new place. Recommendation system makes searching easy. Recommendation system is very popular in e-commerce, tourism, hotels. Recommendation system takes following three approaches: content based, collaborative and hybrid recommendation approaches. Recommendation system makes search easy means which filters the data from the huge amount of data available in the worldwide web. The present paper describes how this recommendation system can be developed for the schools. This paper uses collaborative filtering technique for finding the nearest neighbouring schools.

27. E-TOILETS USING ELECTROMAGNETIC CONTROLLING SYSTEM FOR WATER SAVING

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The idea behind the e-toilets with electromagnetic controlling system is to save more than 50 % of tap water in our day to day life. This system includes electronic control system, electromagnetic double joined valve, domestic water reuse and feed water pipeline system. our system reuses domestic waste water for maintaining e-toilets hygienic. A self-regulation cleaning device ensures no jam for using wastewater. The result indicates that the system remarkable water saving effect than common toilets.

28. IMAGE SECURITY WITH IMAGE DOWNGRADING AND MODIFIED VIGENERE CIPHER

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Modern computing is observed to be highly dependent on communication and data transport. The security of data during communication has become mandatory since the introduction of e-commerce, mails, etc. Encryption or steganography of data is the basic requirement today and thus helps to maintain confidentiality of data. This work combines steganography and encryption methods to provide dual security to images.

Image downgrading is a special case of substitution system in which images act both as secret messages and covers. Given a cover image and secret image of equal dimensions, the sender exchanges the three LSB's of the covers grayscale (or color) values with the three MSB's of the secret image. The receiver extracts three LSB's out of the stego image, there by gaining access to the most significant bits of the secret images. These three bits are sufficient to get a rough approximation of the secret image.

Matlab is used as a simulator to implement the techniques of encryption and steganography. In Encryption, the data can be safe guarded by the key management. Once the data is encrypted, the data cannot be decrypted without the same key. If a different key is given, a distorted image will be obtained instead of the secret image. In modified vigenere cipher, by encryption we get scrambled image, where as in vigenere cipher it will show less distortion in image.

In Steganography after embedding the data into image, the image may lose its resolution but in the proposed approach, the image remains unchanged in its size and there will be a slight change in resolution which is not visible to naked eye. This could protect the data from unauthorized users.

Keywords: Encryption, Steganography, Image security, Modified Vigenere Cipher

29. INTERNET OF THINGS BASED PEOPLE MOVEMENT AND COUNTER SYSTEM USING RASPBERRY PI

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Today automation is required in all the cases to support decision making. This paper describes the people movement and counter system using Raspberry Pi. A Raspberry Pi is responsible for sensing people movement at specific point of location and streaming to the cloud server. The counter readings are accessible from any type of client applications including android mobile client. The application is implemented in python scripting language to sense the people movement at specific point of place and recording it into the local SQLite database as well as Ubidots cloud server. Unidots is a free cloud server to store and analyze sensor data in real time. The python program stores the people count in local SQLite database and uploads the same information to the cloud server in JSON open information exchange protocol format. In cloud server, a servlet was developed to process the requests made by different kind of client applications. Based on the client request, the cloud servlet program will generate the JSON output and give it to the respective client. This system allows to view the people count and movement from anywhere in the world because sensed information is hosted in the cloud server which can be accessible over the internet. In addition, this implementation supports multiple Raspberry Pi devices to stream the people count at different locations. RESTful architecture is used to display the reading of people count in GUI (Graphical User Interface) form for android mobile clients. Further, the message notifications are also implemented for android mobile clients, whenever specific threshold counter is encountered. This implementation is used in many application areas such as shopping mall to identify the behavior of the customer, event management, smart cities, how many people enter into the shopping mall, in which place they waited long time, what path they have taken to enter into shopping mall and so on. Our implementation can’t use any sophisticated camera to count the people. Instead of that, it used simple motion sensor to get the reading of people movement, in some applications this may be enough to take decisions. However, this implementation can be applied to other application areas like environment parameters monitoring, animal tracking system, health monitoring of patient and so on.

30. IMPORTANCE OF INFORMATION TECHNOLOGY FOR VISUALLY IMPAIRED CHILDREN AND YOUNGSTERS AND EXPECTATIONS FOR FUTURE DEVELOPMENT

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Having been involved as an independent consultant in research, development and consulting activities on visual impairment, enabling technologies and accessibility issues for the past decade and a half, the author discusses the importance of information technology, IT literacy and information access for visually impaired children and youth. The discussions focus not only on information technology as an enabling technology to be deployed by disabled users. Additionally, it discusses the importance of general-purpose IT skills for everyone who wishes to play an active role in the information society.

Vignan University is the Institute developing tools for the educational development of blind and partially sighted children and youth in surrounding area’s like Guntur and surrounding districts and has national responsibility. The visions, opinions and positions discussed in this paper are the sole responsibility of the author. However, Vignan University and the visions presented by the institution have been significant sources of inspirations.

Although the cases discussed in this paper are INDIAN, most have a global perspective; hence, the conclusions are equally valid in most other countries.

31. CARCINOGENIC RISK ASSESEMENT OF INDIAN FOOD AND REMEDIAL MEASURES

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India is the part of the earth planet where the mixed communities survive with co-operations but their food habits varying ranging from pure-vegetarian [north pocket], mixed vegetarian and non-vegetarian [areas touching to the north zones], pure non-vegetarian [certain areas of the India's beginning from east to west north to south]. Actually our India is a developing country with one of the most diverse population and diets in the world. Globally the incidence of the cancer though lower in our country [Table1], but alarming episode coming before us is mitigation of rural population to the cities, increasing life expectancy and changes in mode and types of food. If statistical analysis is viewed, then no hesitation to state firmly the incidence of oral and esophagus cancer in India is highest globally owing to food habits, while lung, prostate and colo-rectum seen to lowest one. *Rates of certain cancers are changing in India with ongoing economic development, increase in life expectancy and rise in adoption of the western style [Dr.RSinha, Ph.D.NIH, Bethesda USA].* Now the problem is what is **cancer**- Cancer is ultimately the result of the cells that uncontrollably grow and develop but do not die normally. Normal cells in the body die as new cells grow. Programmed cell death is called as the apoptosis and when this process breaks down then cancer begins to grow and divide very fast which leads to the mass of cells so called as the Cancerous tumour [malignant tumour]. This tumour nourishing from normal cells in beginning, behaving normally in physiological mechanism but on well flourishment cause high disturbances in physiological activities, which seen in form of the symptoms, when the migration of the cancer cell occur through blood or lymphatic channel then designated as the secondaries. There are many forms of the cancer that effects human body [1] Sarcoma: effects blood vessels, bones, fat, muscles and connective tissues. [2] Carcinoma: effects tissues that cover internal organs. [3] Leukemia: of blood forming tissues, [4] Lymphoma: Cancer of lymphatic system..

India has crossed many ascending thresholds of the modern civilizations in natural and synthetic food production which has given birth a new scientific advancements but the harmful scenario like cancer prevalence can not be ignored in any way. As we know at present 1 member out of the 50 families is effected from the cancer in coming 2030 year 5 members out of the 50 families will be effected from the cancer. Now the problem is who is responsible for the carcinogenic food. There are many resources which take the carcinogenic responsibility like use of roasted and cooked meat, bitter taste nuts, synthetic over nitrogenous crops [Punjab tragedy], and vegetables, fast food [Chinese foods], daily use of alcohol with food, use of smoked or non smoked tobacco, betel quid chewing, salted tea, high body mass index due to over eating genetically mutated potato and brinjals, saturated fats intake, dried fish, high temperature food, high consumption rice, consumption of chillies in high amount, coloured sweets, and many more [Table 2].

As concerned to the **remedial measures** the less use of the alcohol 2 pgs/ day X 5 days for the men and 2 pgs/ day X 3 days for women [no alcohol after pregnancy confirmed], avoid use of bidi, cigarette smoking, avoid use of smokeless or smokeless tobacco, betel quids, avoid fast foods, use organics pulses, wash thoroughly all vegetables before cutting, use balanced diet [Table 3], use salad and many more.

In **Conclusionary scenario** diet is actually an important factor in cancer aetiology and in remedies. As a society, Indians have one of the most interesting food with many carcinogenic constituents. India is very unlucky that few research has been done in this area needs energetic, enthusiastic, devotional researchers.

Finally if the life style and food habits get modified by us taking a bit precautions, then we and our family and even our nation will be free from the cancer disease. So let us join hands to explore the slogan **Use balanced diet and keep ours free from the paws of cancer.**

32. REMOVAL OF TOXIC POLLUTANTS FROM WASTEWATER USING HIGH EFFECTIVE ULTRASONIC MODIFIED BIOMASS : NON-LINEAR REGRESSION ANALYSIS

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The present research deals with the preparation of high effective surface modified biomass i.e. *Spirullinaplantensis* using ultrasonic modification methodology to remove the toxic pollutants from the wastewater. The parameters influenced such as contact time, biosorbent dose, initial pollutant concentration, pH and temperature were optimized for the maximum removal of pollutants from wastewater. The prepared novel material was characterized by using FT-IR, XRD, TGA and SEM-EDX analyses to check its influence for the removal of pollutants from the wastewater. Adsorption isotherm and kinetics were studied by using non-linear regression analysis and the results showed that the Freundlich and pseudo-first order models were closely fits to the experimental data. The thermodynamic parameters such as Gibb's free energy, change in enthalpy and change in entropy were calculated and the results indicated that the present system was of spontaneous and exothermic in nature. The prepared materials showed higher affinity for the removal of pollutants from wastewater. This material can be effectively used for the industrial wastewater treatment in the place of existing commercial material.

Keywords: Adsorption; Isotherms; Kinetics; *Spirullinaplantensis*; Thermodynamics; Toxicity

33. INTERNET OF THINGS (IOT) - A SCI-FI TURNED INTO REALITY TOUCHING HUMAN LIVES IN REAL-TIME

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We’re entering a new era of computing technology that many are calling the Internet of Things (IoT). Machine to machine, machine to infrastructure, machine to environment, the Internet of Everything, the Internet of Intelligent Things, intelligent systems—call it what you want, but it’s happening, and its potential is huge. We see the IoT as billions of smart, connected “things” (a sort of “universal global neural network” in the cloud) that will encompass every aspect of our lives, and its foundation is the intelligence that embedded processing provides. The IoT is comprised of smart machines interacting and communicating with other machines, objects, environments and infrastructures. As a result, huge volumes of data are being generated, and that data is being processed into useful actions that can “command and control” things to make our lives much easier and safer—and to reduce our impact on the environment. The creativity of this new era is boundless, with amazing potential to improve our lives. How does the IoT turned into reality touching human lives in real-time?

To answer the above question and The objectives of this paper are to overview and analyse the technological and social approaches of the IoT application areas. Applying things, which are connected in networks, could revolutionise many industry and service sectors thus creating new service provisions and administration methods based on information technology. As the IoT continues to develop, further potential is estimated by a combination with related technology approaches and concepts such a Cloud computing, Future Internet, Big Data, Robotics and Semantic technologies. The idea is of course not new as such but, as these concepts overlap in some parts (technical and service architectures, virtualization, interoperability, automation), genuine innovators see more the aspect of complementarity rather than defending individual domains. Practical cases show that the applicability potential for IoT is wide; however, technological basis, legal regulation and the value to the end-user are the fields worth discussing in order to better understand the possible positive and negative aspects of the technology.

34. A LITERARY SURVEY ON TECHNOLOGIES BEHIND THE INTERNET OF THINGS

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Before being to the broader views of the survey the paper reflects the gap between present technologies in the field of Internet of Things, it assists the researchers to ease through the facts and constructive technologies in this arena. While presenting the comparative study on different technologies like actuator networks, tracking technology and communication protocol and reporting and reviewing various technologies. As this enables the major issues of Internet of Things to the researching community, further it shows the Machine to Machine (M2M) and Machine Type Communication (MTC) which is applicable on development of Smart Cities.

35. MALIK MANAGEMENT SYSTEMS FOR EFFECTUATING NAMAMIGANGE

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The Ganga River is of immense importance for the region and its people. The basin is one of the largest basins and one of the most fertile regions in the world. It is home to approximately 40% of the Indian population; it is their source of living, economic activity and place of worship.

A great vision, shared by all Indians, is to have a clean River Ganga with prosperous cities along its paths, flowing through India’s historic landscape, with agriculture and sustainable industries on its banks, enriched with numerous ceremonies and festivities on the thousands of Ghats that flower with the traditions of the deep Hindu culture. This vision has gained strong momentum with the announcement by the Government of India under Prime Minister NarendraModi of “NamamiGange”, an integrated Ganga development project to restore the pride and the glory of Ganga.

It is far more than cleaning the Ganga River; it is an act of purification of India’s arteries; a vision of transformation of the entire country; a transition from poverty to prosperity. This vision implies that the Ganga is physically cleaned, a comprehensive development and sustainability plan is established, each city/village is linked by adequate infrastructure, technology, sanitation, schools, colleges, hospitals, develops skilled workforce, provides state of the art facilities for agriculture, new industry, electricity including hydro-electricity thereby eradicating poverty and empowering the people to become more self-sufficient and prosperous.

This epochal transformation project requires the most advanced and suitable technologies in all relevant technical fields and equally so, a fundamental shift in the mind-set amongst the people of India. It demands political vision and willpower along with a new kind of effective management and governance for social transformation. Ultimately, the envisioned transformation towards prosperity can only be fruitful and long lasting if all layers of society are activated – and a mass-movement created – towards the same goal.

This presentation provides an overview of the most advanced Malik systems, basic models and a selection of tools and methods that will ensure the effective implementation and reliable governance of the Ganga Project.

Keywords: Ganga River; NamamiGange; Great Transformation; Malik Management Systems; Effective Implementation; Leadership; Sustainability.

36. MALIK ECOPOLICY AND SENSITIVITY MODEL – A SIMULATION ‘GAME’ FOR LEARNING ABOUT SYSTEMS THINKING, LEADERSHIP FOR SUSTAINABILITY AND A SYSTEMS TOOL FOR DEALING WITH COMPLEXITY

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Despite many efforts to deal with the various complex issues facing our societies, plans and problem solutions are seldom long lasting, because we, as individuals, and our leaders are most likely to fall into the trap of using traditional linear thinking. It is natural and easy, but does not usually deliver long-term solutions in the context of highly complex modern communities and societies. There is an urgent need for innovative ways of thinking and a fresh approach to dealing with the unprecedented and complex challenges facing our world. It is essential for current and future leaders and citizens to be prepared for systems thinking to deal with complex problems in a systemic, integrated and collaborative fashion; working together to deal with issues holistically, rather than simplistically focusing on isolated features. A revolutionary educational tool (Ecopolicy) is used as the main mechanism to achieve this aim. Furthermore, Sensitivity Model (the ‘engine’ of Ecopolicy) is used as a systems tool to address complex problems and achieve sustainable outcomes in a various areas, organisations, businesses, etc.

Keywords: systems thinking; systems education; complexity; Ecopolicy simulation game; sustainable development; SensiMod; management; sustainability

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37. THE HUMAN GENOME PROJECT AND THE DISCOVERY OF AZQ (US PATENT 4,146,622) SPECIFICALLY DESIGNED TO SHUT OFF GENES THAT CAUSE BRAIN CANCER

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Dr.Hameed Khan was born in Hyderabad, India, educated in England, received Doctorate Degree in Chemistry from the University of London. As a Fogarty International Scholar Awardees, he came to America in the laboratories of the National Cancer Institute of the NIH. He has worked for NIH for the past 20 years as the Senior Scientist in NCMRR. Dr. Khan is the discoverer of (AZQ), Aziridinyl Quinone, a novel class of drugs that passes across the Blood Brain Barrier and attack brain tumor DNA shutting off gene that causes Brain Cancer. Over the years, Dr. Khan made over 200 Aziridinyl compounds which were tested against a variety of experimental animal tumors. Forty-five of them are considered valuable enough to be patented by the U.S. Government (US Patent 4,146,622). Radio-labeled study showed that it is the Aziridine Moiety that binds to the DNA nucleotide Guanine shutting off genes. His discovery of AZQ opens path to treat a variety of cancers. Chemicals that exhibit affinity for an organ could serve as a carrier for Aziridine groups to attack tumor of that organ. There are about 220 different tissues in our body and they all could develop tumor if their DNA is mutated. Fortunately, there are several coloring dyes to color every tissue of our body. Dyes could be used as a carrier for the Aziridine groups to attack their tumor DNA. A literature search shows that the International Scientific Community recognizes the significance of Dr. Khan’s work. Using AZQ, they published more than 300 research papers in scientific literature. NIH considers his work is so valuable and innovative that he was honored with the “2004 NIH Scientific Achievement Award” one of the America’s highest awards in Medicine. He is a Fellow of the American Institute of Chemistry and was elected to the American Science Advisory Board.

38. GREEN DATA CENTERS – A STEP TOWARDS MINIMIZING CARBON FOOTPRINT

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Information Technology plays a vital role in the success of every business. It has also become a significant contributor to the climatic crisis of the current day. Climatic crisis due to global warming and other environmental issues have made the people and the business community to become more social and environment conscious. Many companies are moving towards “IT greening” by reducing their energy consumptions and adopting green computing principles in acquiring IT infrastructure and by pursuing energy efficient solutions. Data center is one such facility that has the electronic equipment to centralize the organization’s IT operations by storing, managing and disseminating the data, with a high consumption of energy.

This paper projects the transformation of Conventional Data Centers to Green Data Centers. It elaborates the issues to be taken into consideration while designing green data centers. It also emphasizes the aspects surrounding the implementation of improvements in greening IT and reducing the carbon footprint.

Keywords: Data Center, IT Greening, IT Infrastructure, Green Data Centers, Carbon Foot Print

39. IMPORTANCE OF ARTIFICIAL INTELLIGENCE IN INTERNET OF THINGS

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Internet of Things is just data flowing between devices. It is not as powerful as data flowing between intelligent things that can decide for themselves. The billions of things that fall under the domain of IoT produce massive volumes of data, and this is where the greatest potential lies. Big data focusing on accumulating the right type of data, and using it to find solutions to specific problems. An innovative way to keep up with this IoT-generated data and gain the hidden insights it holds is with artificial intelligence. AI-enabling what have previously been “dumb” devices adds a new layer of functionality and access, creating the basis for smart homes, smart cars, and smart manufacturing. The data collected, combined with AI, makes life easier with intelligent automation, predictive analytics and proactive intervention. This paper mainly focuses on the functionality of Artificial Intelligence on Internet of Things.

Keywords: Massive, IoT, AI, data, flowing.

40. SYSTEMS THINKING: AN APPROACH TO CONCEPTUALIZE & DESIGN COMPLEX SYSTEMS

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'System acts as a whole' is an accepted paradigm for 'Systems Thinking'. In today's complex societal environment, which encompasses or influences systems of all kinds, business or otherwise, it would be difficult to resolve problems unless we use the 'system thinking' approach to conceptualize the contexts.

Since complex problems are not amenable for simple direct perception, they require systemic models to understand and analyze the problem situation. Modelling is the common method employed to cope with complexity and hence is a natural and essential requirement in handling a complex problem. In order to solve this we need to design a checklist of various dimensions to be probed and patterns to be unearthed to get a holistic understanding of the problem situation or context. It requires recognizing the fact that different stages of problem solving, broadly Discovery, Diagnosis and Design, require different ways of thinking. During the course of problem solving the focus shifts from seeking information (Discovery) through seeking interpretation (Diagnosis) to seeking ideas (Design). However, every stage requires divergence and convergence of views. This calls for adopting different models to address those perspectives. The whole process would involve a system thinking approach leading to an application of multiple models (Multi-Modeling) which are synthesized to arrive at a conceptual design for the system.

This talk will take you through an approach which can be applied for conceptualizing and understanding systems of all kinds, the focus of the author has been on Business Systems predominantly.

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41. CHALLENGES AND OPPORTUNITIES OF IOT

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The concept of combining computers, sensors, and networks to monitor and control devices is popularly known as “Internet of Things” (IoT). The IoT is expected to transform the lives of humans in various aspects including the way we sleep, eat, work etc;. It will make our lives safer by using sensors for vehicles that can detect and avoid accidents. It will make our lives more green by adjusting the lights, fans and other electronic gadgets according to the room temperature. It will save our lives with smart watches and smart jackets that can detect severe health issues well in advance. On the other hand, IoT involves a complex and evolving set of technological, social, and policy considerations across a diverse set of stakeholders. It is required to address the challenges and utilize its fruits to maximum extent possible while reducing its risks. As there will be hundreds of billions of devices that are connected challenges like security, network connections, protocol issues come into picture. By extending and combining the services provided by cloud, big data, machine learning and mobile applications together leads to an amazing human life.

42. GREEN ENERGY TECHNOLOGY FOR TELECOM APPLICATIONS

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The sustainability of our planet is an important goal as we have ever had. There is a necessity for the development of a individualistic power industry which serves the public interest by providing the cost effective electricity for a eco-friendly environment and efficient development of the available energy resources. The objective of this paper is to highlight the Green Energy Technology in terms of need, types of GETs, features, applications, drawbacks, challenges, etc. Green Energy Technologies are not only simple power sources for telecom but they are helpful in keeping environment as clean and green. Instead of Green Energy Technologies, the term ‘Word Green Telecom’ can be used in Telecom applications. Green Energy Technology is essential in limiting global warming and protecting ecosystem by reducing Co₂ emissions through energy efficiency and use of renewable energy. Green Telecom theme is to promote carbon accountability in the telecoms industry. The demand of renewable energy for environmental concerns has been increasing rapidly. Though the Green Energy Technologies are readily available in the market, but there are some issues and challenges along with barriers in implementation.

43. IN-VITRO EXPERIMENTAL STUDIES ON PHYTOCHEMICAL SCREENING AND ANTIMICROBIAL ACTIVITY OF *HEMIDESMUS INDICUS* (L.) R.BR.

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Plants are a tremendous source for the discovery of new products of medicinal value for drug development. We opted *Hemidesmus indicus* (Sugandhipala/Nannari). The extracts from root, stem and leaf were collected by using solvents methanol, chloroform. They were qualitatively tested for the detection of alkaloids, flavonoids, tannins, steroids and phenols by using standard phytochemical methods (Harborne, 1973). The antibacterial effect was evaluated on bacterial strains *Bacillus subtilis*, *E.coli*, *Proteus* species and *S.aureus* by agar disc diffusion method. The results obtained in the present study suggest that they can be used in treating diseases caused by them.

Keywords: Medicinal Plants, *Hemidesmus indicus*, Phytochemicals, Antimicrobial activity, drug development.

44. MICROPROPAGATION OF MEDICINALLY IMPORTANT CLIMBER-*TYLOPHORA INDICAMERRILL*. FOR FUTURE DEMAND

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Tylophora indica Merrill (Damvel) is an important medicinal climber of India. It is also available on many hedges of Vadlamudi and Tenali region of Guntur District. Plant has high demand for its medicinal values. It helps in treatment of many diseases like cough, asthma, bronchitis, dysentery, diarrhea, wounds, ulcer, hemorrhoids, malignant tumor, and leukemia etc. Beside this all most all the parts of plant are important so it is up rooted and exploited highly for obtaining medicine. This destructive harvesting of the plant and many other threats like deforestation etc. limited the plant population in present days so, extra care for its multiplication is needed along with its sustainable use. Present work of micropropagation by using basal MS media supplemented with different dosages of hormones were standardized for developing an efficient micropropagation protocol for this important climber which will fulfill future demand.

Keywords: Micropropagation, Medicinal plant, *Tylophoraindica*, conservation.

45.A NOTE ON BIODIVERSITY & CONSERVATION

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Conservation of Biodiversity is a serious concern for today's Societies. The decrease of biodiversity in an ecosystem or in an order frequently threatens its health. Calculate approximately of the figure of species at present living on soil choice broadly, mostly because most living species are microorganisms and small invertebrates, but the majority estimates go down between 5 million and 30 million species. Around 1.75 million species have been formally described and specified taxonomic names. The quantity of under scribed species is certainly a great deal higher, though, now one assembly of animals without help, the insects, may account for an implausible 50 million species.

At least 40 % of the world's economy and 80 % of the needs of the poor are derived from biological resources. In addition, the richer the diversity of life, the greater the opportunity for medical discoveries, economic development and adaptive responses to such challenges as climate change. In spite of expressive about biodiversity significance for a lengthy time, human movement has been causing enormous extinctions. Internationally, enormous efforts have been made so far to extensively reduce the present rate of biodiversity loss. The present paper deals with the concepts of Biodiversity & Conservation and Sustainable use of natural resources, also focus on convention of biological diversity implementation by the participation of various Government, Non-Govt. agencies and stake holders.

Keywords: Biodiversity, conservation, ecosystem, climate change, sustainable use, natural resources.

46. HOW INDIAN SUPPLY CHAIN DISRUPTIONS AND MODERN SUPPLY CHAIN RISK MANAGEMENT PRACTICES PRODUCE TROUBLING ENVIRONMENTAL CONSEQUENCES

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Activities under the banner “Supply Chain Management” now comprise a major share of the world economy. This encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities, such as transportation and inventory management. The various functions are visible, physical, highly exposed, and vulnerable to various risks and disruptions. Disruptive events have varying degrees of frequency and impact, and tend to not only negatively affect the operational and financial performance of the companies comprising the supply chains, but also hurt innocent outsiders through negative spill-over effects and externalities.

We performed empirical research in India that revealed the risk factors with the most prevalent and severe impact on supply chains. The research also showed which risk mitigation methods were the most useful and popular given the various categories of risks encountered. This paper argues that not only do the various disruptive events have a negative effect on the ecological and social environment, but the most popular mitigation methods applied to either prevent the events from happening or minimizing their damage are also hurting the environment in direct and more subtle ways.

India presents a high risk operating environment for supply chains, with pervasive disruptions and much waste. The country would benefit in several environmental and sustainable ways from minimizing supply chain risks, leading to fewer harmful disruptions and less costly and elaborate systems of mitigation and damage control.

47. A SYSTEMIC APPROACH TO SYSTEMS MODELLING

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Model-driven engineering builds models of the systems that are then used to generate implementations, and also for human understanding, analysis etc. The primary focus is generally on describing the operational logic of the solution in sufficient detail to facilitate generation of code. There is some focus on describing aspects that relate to derivation and analysis of this operational logic, such as use cases. However, these models usually fall well short of providing a complete capture of our understanding of how the solution is expected to act as a system that is part of larger systems.

This paper discusses our work on expanding the scope of modelling practice to a complete systems description. We focus on capturing both the value context (stakeholder needs) and operational context (peer systems, desired relationships between the target system and its environments), and the processes that result from the interactions between the target system and its contexts. We capture both the declarative specification of what the system and each of its subsystems is expected to do (problem / design intention) as well as the operational logic of how this behavior is realized (solution specifications). In addition to entities, attributes and relationships, we capture property relationships: expectations and constraints on the outcomes of system behavior resulting from the design. This expands the focus beyond the operational logic to design consequences, and paves the way for capturing influence relationships between properties i.e. resulting system dynamics.

This is a description of work-in-progress, with intent to frame the challenge and our approach to the challenge, in order to obtain feedback and ideas from the community. Our goal is to create descriptions that are complete enough to enable understanding and analysis of how the result of design is expected to behave as a system, from two primary viewpoints – the engineering viewpoint that focuses on how the internals of the system work together to achieve particular functions and characteristics, and the operational viewpoint that captures the target state vision of how this delivered solution will interrelate and interoperate with the environment to deliver desired (and perhaps some unintended) outcomes.

We present our theoretical conceptualization of what is needed to create such a systemic description: capture of structural elements in system and context, processes that operate on these structures to generate behaviours, descriptions of the outcomes resulting from these behaviours, and descriptions of the desired outcomes in terms of characteristics, processes and relationships. Capturing these elements in a description enables closure of loops in the design space, so that both static analysis and dynamic monitoring techniques can be used to identify and close gaps between desired and actual outcomes. We link the concrete extensions to modelling practice discussed above to these theoretical aspirations.

The paper discusses our current work on creating a monitoring and control design environment based on the above principles.

48. MOLECULE CONSTRUCTION AND DESIGN USING VECTOR NTI

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Abstract:

This Bioinformatics work aimed at to demonstrate the creation of a new DNA molecule by *construction*. In Vector NTI terms, construction means creating a DNA molecule from fragments which are completely defined and made compatible by the user. DNA molecules can be composed of several different types of fragments: fragments of existing DNA molecules, linkers, adaptors, etc. usually require much less work to describe. Fortunately, Vector NTI has a special tool for describing a new molecule fragment and allows adding fragments quickly and easily. Besides construction, Vector NTI has several other ways of adding new molecules to its database. We can import molecules from GenBank, EMBL or FASTA files; we can describe the maps of a new molecule by hand and read its sequence from a text file. We can also design new molecules with the help of Vector NTI's built-in biological knowledge. Molecules which you or Vector NTI creates from fragments of existing molecules are called *constructed* molecules. Molecules which we import or describe by hand are called *basic* molecules because they enter the database as whole, entire units rather than being built up from fragments. In the present work our objective is create a new molecule by cloning the tetracycline resistance gene from pBR322 into pUC19, using the EcoRI and AvaI restriction sites on pBR322 and the EcoRI and SmaI sites on pUC19. We have followed these steps. 1. Launch Vector NTI, 2. Create Display windows for pBR322 and pUC19-(Activate the Database Explorer window and switch to the DNA/RNA molecules table. Select the DNA/RNA Molecules (MAIN) sub base, select the pBR322 and pUC19 molecules and choose the Open command from the Explorer's DNA/RNA menu. We should now have two Display windows open, showing the text descriptions, nucleotide sequences and functional and restriction maps of pBR322 and pUC19), 3. Arrange the Display windows-We will now begin to define our goal molecule. The first fragment will be part of pUC19 and the second fragment will come from pBR322. 4. Define the first fragment-The first fragment will include most of the pUC19 molecule. The 5' end of the fragment will be the SmaI restriction site and the 3' end will be the EcoRI restriction site. 5. Define the second fragment- Switch to the pBR322 Display window. Click once anywhere in the graphics pane and then Add Fragment to Molecule Goal List button to display the Fragment Wizard dialog. Move the dialog up or down so that you can see the EcoRI and the AvaI restriction sites on the graphical map of pBR322. 6. Inspect the Goal Molecule Definition List- check the Goal Molecule Definition List to make sure our fragments were properly included. The Component Fragments section of the dialog box contains the Goal Molecule Definition List. The list consists of the two fragments us defined.7. Enter general information about the new molecule-Press the General Info button. In the General Data dialog box, you can specify general information about the new molecule.

Click in the Description field and type “Tutorial molecule #1”.

In the Extra-Chromosome Replication field, check “Bacteria”.

In the Replicon Type field, select “Plasmid”.

8. Attempt to construct the new molecule - Vector NTI will attempt to construct new molecule and save it into the database. Since us attempting *construction*, we have defined all fragment termini; As it turns out, fragments are incompatible because the blunt 5' end of the pUC19 fragment can't link with the cohesive 3' end of the pBR322 fragment.
9. Fill in the *Ava*I site of the pBR322 fragment to make it blunt-Look at the Component Fragments section and click on the second fragment in the list (“Mol fragment of pBR322”). Vector NTI analyzes molecule and this time enters it into the database without complaint.
10. Inspect your new molecule -After creating the new molecule and saving it to the database, Vector NTI opens a new Molecule Display window containing the molecule. Hence, we concluded here the program itself determines how to create the goal molecule.

Key words: Vector NTI, pBR322, *Eco*RI, GenBank, EMBL