

Activity Report of EASTS IRG (International Research Group)

Date of Submission: 30 / 07 /2008

1. IRG code and Name of IRG

- 1) IRG code: IRG -04 - 2005
- 2) Name of IRG: Scale free Characteristics of Traffic Network (IRG SCAFT)

2. List of research members:

Name, affiliation, country/area

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3. Purpose and Mission of IRG:

IRG SCAFT is a research group established in year 2005 by EASTS community to harness emerging science of complex network and superstatistics to look into the problem of design and planning of optimal integrated transportation systems and to study and measure the topological and dynamical properties of gradient induced flow entities within traffic and social networks.

Our group is currently composed of independent researchers from university of Queensland Intelligent Transport Systems Research Laboratory, Barkatullah University Space Laboratory, Brisbane Institute of Advancing Learning and CATT Systems.

4. Past Achievements

1) Paper, Report or Book: (Title, Authors, Year, Name of journal etc.)

(You don't need to attach the files.)

Mojarrabi, B (2008) Principle of Ever Advancing Civilization: Upgrading the Criterion for superstatistical framework of social and transport network, ATRF08

2) Seminar, Symposium or Special Session: (Title, Date, Venue & abstract)

3) Group meeting: (Date, Venue & abstract)

Mojarrabi, B Gwal, A. K Bhattacharya, S Dia, H Molaei, B and Gwal, A (2008) Graph analysis of global Integrated Transport ANN systems using GPs and Superstatistical tools, IRG SCAFT research progress February 2008 group email

Summary and discussion of research review:

IRG SCAFT is a research group established in year 2005 by EASTS community to look into the problem of design of optimal integrated transportation systems. The core feature of our proposed group is to study and measure the topological and dynamical properties of gradient induced flow entities within traffic and social networks using tools developed from superstatistics and GPS technology. In our method both input and error signals of the ANN nerve system will activate through a central humanitarian local hubs, i.e. the origin of local network gradient scale free induced field. However, please note, our method is not simply an intelligent hybrid.

In figure 1, we can see the expansion of superstatistical model to urban planning using the concept

of humanitarian hub. Humanitarian hub function as a new form of conflict resolution as its eigenstructure contains the synchronization codes of all major religions. Commercial hub can be mono-centric circled around humanitarian hub or multicentric spread in different location within business and housing districts. For practical purposes, it is important that the flow paths of gradient induced flows of both commercial and humanitarian hubs are optimally converge in order to promote a global cultural integration that humanizes.

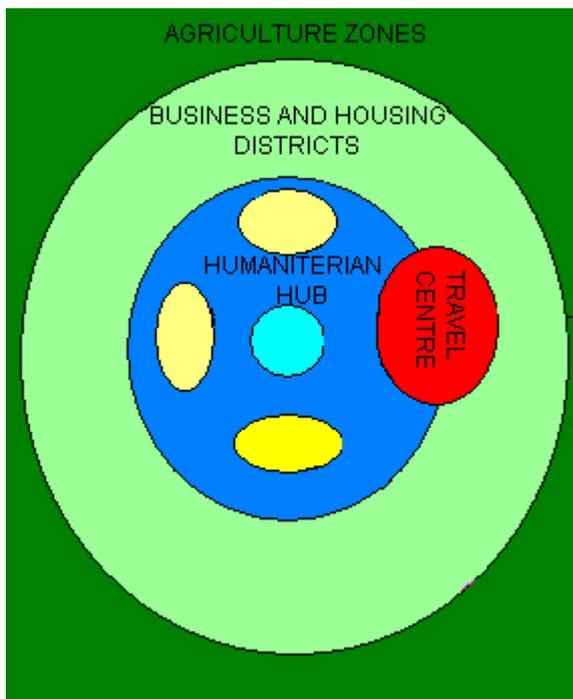


Figure 1 Land use model in Superstatistical framework. Central green circle is a temple offering universal worship for all different religions. The yellow ellipses around the temple are the auxiliary humanitarian buildings such as hospital, school, university, community centres and travel centre to form the humanitarian hub. These humanitarian hubs join together based on topological and dynamical characteristics of gradient network to form global integrated urban system. Humanitarian hub can function as a new form of conflict resolution as it promotes cooperation/partnership between the nodes.

A local gradient field can grow when

$$\omega(E, \Gamma) = \omega(E)\omega_i(E, \Gamma)$$

(2)

Here $\omega_i(E, \Gamma)$ is the structural factor of the local field in the state of dynamical weight assignment equilibrium and $\omega(E)$ is the structural factor of common faculty at absolute scale. As a physical example, we can visualise a transport system in which initially the number of its links and roads are more than the number of vehicles on the road. Travel time behaviour changes as the number of vehicles entering the roads continue to grow up to the final stage where the congestion occurs and the system degenerate. Here First Passage Time (FTP) is the time from microstate at very early stage till the time before congestion occurs. We can adapt to the changes in travel time behaviour through the timing circle of the traffic lights using equation 2. $\omega_i(E, \Gamma)$ is the structural factor of individual traffic lights while $\omega(E)$ is the structural factor of traffic lights group controllers centred around the fittest node (i.e. the emergence of clear time scale entity). For this reason, IRG SCAFT (2007) suggested artificial neural networking Systems (ANN) as the promising technology for proposed global integrated transportation which can be based on optimal characteristics of gradient induced flows of both commercial and humanitarian hubs. Now we back to our discussion.

The neighbors of the clear time scale node cooperate to form local clusters. This new synchronized clusters will join together creating larger and larger community structures up to the final stage when the entire population has synchronized their phase. This process of cluster formation tends to prefer direction along a trajectory originated at the center of the clear time scale gradient field in analogous with concept of energy levels. As time passes, complex functional and hierarchical relations will develop as a sequence of transitions between various classes of the system states. As an example, we can hypothesis the commercial development along the major routes surrounding a shopping centre as geometrical patterns of the first passage time of the gradient induced flow of the shopping centre. Similarly, we can describe that community structure and cluster formation within social networks is due to anisotropic nature of the FPT of their clear time scale GIF entity

(Religious Founders). The anisotropy is a result of positive feedback response of individual nodes (with different fitness) at microscale level to their GIF central entity against the background of environmental fluctuation field and will lead to creation of gradients in the direction of central node. The FPT anisotropy will increasingly advance complex cycles of the social interaction and hierarchical relations. In social network this is termed as the **direction of an ever-advancing civilisation**. Here, there are two new developments.

Firstly, we propose the clear time scale GIF entities of religious communities can act as a marker on the historical time scale enabling us to evaluate the progress toward an ever-advancing civilisation. This statement has been made because we can detect changes in the non-extensive nature of the q -entropy along each cycle of their growth using tools from superstatistics.

Secondly, the appearance of each clear time scale GIF entity of the social network points to the existence of accountability deficit with regard to social capital progress. This only possible when the emergence of new centre of attraction with maximum betweenness centrality in social network is accompanied by a resetting of the previous system defaults set by previous clear time scale gradient induced field entity. That means there is a period of relapse in accountability toward international ordering. The next step is the issue of Interoperability and consistency in the application of principle of ever-advancing civilisation for the purpose of building global integrated systems. Interoperability operations for global integrated transportation are particularly relevant for emerging global administration, the form and function of which anticipated to be shaped by the emerging religious international ordering as well as domestic and national regulations and jurisdictions. Here we suggest in addition to distance minimisation criteria, the structural diversity of religion community within a given geographic unit need to be considered as another important condition in the choice of the key nodes.

3.1 Semantic Interoperability

The Interoperability issues that raises due to application of principle of ever-advancing civilisation

often require semantic that contain comprehensive global information. Semantic concerns the study of meaning beyond data. A Semantic interoperability based on superstatistical framework can be defined as data plus meaning and first passage time plus noise. There is plenty reasons to argue that USA as a major vehicle in world economy could seriously effect the interoperability and integration strategy of proposed global integrated transportation. For example, at the present, a significant number of key nodes have already established their own cultural planning with possibly incompatible semantic structures. USA has facilities in proximity to most of the key nodes and most importantly Israel (the central node with global ANN control capability) to advance the move toward compatible semantic structure. For this reasons, we believe, the proposed East Asian regional integrated transport and urban systems would best to proceed as a subset of global integrated transportation because of semantic interoperability feasibility path considerations.

4) Result of Application to other research funds: (Name & result)

5) Promotional activities of your IRG: (Home page, Newsletter, Mailing list etc.)

Will you continue your IRG activity in next term (after August 2008) ? [YES / NO] Yes

→ If “YES”, please answer the following questions.

5. Future research plan including time frame with the following items:

The nature of power law exponents and the time series studies in social and transport networks including contributions from power-law correlations from fluctuation field, gradient induced fields, and power structures resulting from the joint probability of these two.

- Planned seminar, symposium etc. (Date & Venue)
- Possibility of Special Session at the next EASTS conference in 200: Yes
- Special considerations to young researchers: