Name: G.S.Sheshagiri

Qualification: B.E. [Electronics & Communications], M.S. [Software Systems]

Location: Bangalore **Email:** sheshagiri@cgpl.iisc.ernet.in

Tel: Mobile: 9482442207 / 99644-83322

Deliverability: To Research and guide teams working on Cyber Physical Sub-Systems involving GIS (Geographical Information System) with Navigation (GPS), Mechatronics, Electronics and Electro-Medical engineering.

Accomplishments (Details follow under 'Experience'**):**

- Building IP during the project activities.
- Geographical Architecture, Design, Land data Processing, Land classification into Crops & forest subclasses, nationwide biomass assessment as applied to renewable energy generation using Gasifier & Stoves
- GIS tool development such as for Polygon intersection, Grouping to compress the data, COI (Circle of Interest) geographical remote (java based) processing for biomass, Classification based on Image processing of RSD (Remote Sensing Data)
- ANN and Fuzzy based classifiers using training data
- Group and personnel guidance on technicalities, concepts and design issues concerning GIS, software, algorithms, CAD, electronics, Mechatronics (ESP, electronic control of carburetor, Biomass level control, Industrial temperature control, SACDA for gasifier and engine, AMF).
- Technical guidance to graduate and post graduate students on software & mechatronics
- Provided Technical expert guidance to Design and develop home care & security systems based on microcontroller which had the capability to dial and send audio messages to any pre-designated phones for a start up.
- Designed and developed a computerized ECG monitor for a manufacturer. Also developed pharma software for the same group with doctor appointment, diagnostics and active patient data
- Entrepreneurial activity by establishing a SSI PCB manufacturing facility involving CNC drilling, conveyorized etching, Semi-automatic imaging, SMOBC and HAL Also designed a cost effective BBT system for in house testing of bare boards
- Complete development of Milk data processing, Invoicing and analysis software to check quality of supplies including EDP for the district of Tumkur.
- CAD software development to edit Gerber plots and drill patterns
- Research and design of optically isolated patient safe ECG amplifier

- Design and development of multi-patient multi-channel ECG monitor with computer interface & recording by providing different levels of patient safety which was awarded. DAQ for ECG using micro-processors and A/D converters.
- Development of ECG based diagnostic software for some of the critical cardiac diseases
- Development of implantable demand pacemaker and other cardiac care sub-systems as a co-developer

Experience:

[1999 - Till now as Project Associate at IISc]

Software R & D responsibilities

- Multi-dimensional biomass assessment by developing GIS models for Agro, Forest and waste lands. One of these is geographical assessment of biomass by a remote client in the circle of interest using JAVA. I was also guiding in the development of generation of spatial image at district level to visualize the biomass surplus intensity. Both these software tools assist the entrepreneurs for their site suitability studies before setting up power generation center.
- Modeling and design of rainfall distribution using Gridded data given by IMD (Indian Meteorological Department) for 50 years. Rainfall trend analysis with agro-production was done to develop necessary rule based logic to improve the classification of land use vectors into crop polygons.
- Modeling and design of spatial analysis of irrigated areas for crop production along the canals. This was developed by using Bhuvan/Google rasters by embedding it in GIS.
- Analysis of Biomass utilization as applied to Improvised Biomass stoves replacing the inefficient traditional stoves or chulas.
- Nationwide Spatial Biomass assessment in the waste lands, usable forest area and Scrub is done in addition to agro-biomass. Written Project proposals for new projects from Central Ministry. Modeling Atlas to reclassify the forest into its sub classes using Bhuvan/Google satellite images. I developed the required logic to develop the software.
- Researching thru' Web for forest biomass assessment to develop the methodology to assess biomass power potential.
- Developed MATLAB based software to simulate synthesis of biomass briquettes/pellets based on particle size, particle type etc.
- Researched for the development of an *innovative 'quick', cost effective spatial attribute distributor* for the visualization of digitized geographic Biomass information using *rule based fuzzy system* and attribute linked polygon grouping tool for GIS data normalization.
- It is furthered by researching on to develop improved spatial crop classifier system by establishing biomass attribute relationship using *ANN & Neuro-Fuzzy methods*. Guiding a team to process maps and prepare neural training sets with the available data.

- Monitoring and analyzing at Taluk & District level country wide biomass data for information visualization reported by survey teams to assess the Geographical energy potential in close interaction.
- Architect the client requirement of standalone digital atlas for dynamic geo-graphical querying with friendly user interface. The GIS Software 'Geoconcept' having ActiveX capability was adopted and used in VB & VB.NET.
- Guided GIS team to process, develop and launch national digital atlas to the user requirement both as a redistributable standalone application in VB.NET and a web enabled GIS in ASP.NET. The Atlas is for the visualization of digitized geographic Biomass information consisting of dynamic graphical query for intelligent attribute mining.
- Complete understanding of GIS software (Geoconcept) to adopt it for the development of biomass atlas to achieve geographical assessment. Training and guiding the developers to program for required geographical processing functions such as raster registration, raster to polygon, image processing, polygon to raster, gridding and such others.
- I developed exclusively Polygon intersections and grouping algorithms for agro-biomass assessment to be launched on Web. The grouping algorithm helps to reduce the access time on Web biomass Atlas.
- Also involved in providing guidance to the interns, graduates and post graduates for the development of *Biomass route optimizer, Crop classifiers, Vector processors and special tools successfully* in GIS.

Electronics and Mechatronics R & D

- Presently I am working on the R & D of ESP (Electrostatic Precipitator). I am involved in the experimentation on characterizing ESP to filter the dust and COCs developed during combustion processes. I have also developed electronic high voltage source developing a voltage from 0 to 25kV for the purpose. The necessary measurement circuit to measure both hi-volt and current on the high voltage side is also incorporated for the purpose. I am involved in further development of these circuits.
- I am also working on DAQ for Gasifier and Energy.
- Earlier I had worked on fuel controlled PG carburetor. Presently this is being upgraded to a complex controller of regulating both fuel and air simultaneously to provide proper air to fuel ratio.
- My thesis for MS in the year 2002 was on WEB based DAQ for SCADA purposes. I had developed and demonstrated secured data logging and remote engine control using this web daq system. Later I have worked on NI DAQs (I also guided graduate and under graduate students to develop a software to monitor gasifier & engine parameters) to successfully monitor the parameters such as pressure, temperature, biomass level etc in the renewable energy generation system. I also designed and developed networkable monitoring system using LabView application software.
- I had developed temperature controller with a sequential logic to be used for the purposes of biomass drying to be used for gasification.

- I had adapted CPU fan to be operated upon by a battery. I did it in two steps. Firstly by using the Instrument fan blade with a toy motor to try out for biomass stoves. Then using the instrument fan by controlling the fan speed with PWM which conserves battery power.
- I was involved in the design and development of flow visualization system. Various techniques were tried starting from using Metal halide lamp as light source to laser diode line generator. The required chopping, synchronous operation and strobe frequency measurement were developed for the purpose.
- I was involved in the design and development of highly stable power supply (to the 4^{th} digit) to be used for aero-foil sensors; the knowhow was transferred to a company-Pyrodynamics in Bengaluru.
- I enhanced the AMF by introducing interlock with the engine starting if the engine failed to start. It is interesting to note that the AMF is made of only relays and contactors to suit easy serviceability in villages and remote places.
- In the area of electronic instrumentation & controls as applied to engines & gasifiers-some of the successful projects are Lambda controller [both PLC based and hard wired], Flame timer, hi-energy Ignition system with multiple sparks, Pollutant detector based on colorimetry, Feed stock sensor, Industrial process PLC based timer, Load panel controller, Simulation of PC based fuzzy motor-controller and Intranet enabled engine controller & monitor.

Project Group Activities

I have done internal consulting during project execution. I have trained the fresh engineers for GIS applications and applied engineering. Being in a senior position I have facilitated the group developers for proper balancing of tasks. For e.g. distribution of tasks related to biomass assessment pre-processes for all the states. Planning and flow charting of the processes involved to produce a national biomass atlas was done by me along with regular interactions to put the progress meet the GNATT and the PERT. I have also interacted with external consultants on agro-biomass related data deliverability both at taluk and district levels along with interactions with the central ministry for new & renewable energy (MNRE).

I have also involved in training electronics engineers for circuit testing, CAD, assembly and deployment. I have guided both electronics and mechanical engineers while developing lamda controller, carburetor emulation experiments, carburetor controller, biomass level controller, Load panel controller development, pollutant controller in the gas output from gasifier, electrostatic precipitator (ESP), fan system for gasifier biomass stoves and ESP experiments for renewable energy applications.

I have conceptualized, guided, to write papers, project documents in building IP (Intellectual property) as Author and co-author for all the above mentioned activities.

Training and Presentations during workshops, conference and Seminar

- Presentation at SSS-NIRE: Presented on the topic of the saved biomass assessment accrued out of using improved biomass stoves instead of traditional stoves or chulas. Also presented the tool designed and developed by me on the geographical biomass assessment in the circle of interest.

- I have been training professionals on biomass atlas architecture and concepts during annual international training short term course under UNIDO programs since 2004.
- During a seminar organized at KIIT, Tiptur, Tumkur district, Karnataka, I had presented the biomass assessment pre-processing involving ANN and Fuzzy logics to spatially classify the land use polygons into crop areas to the distinguished academic gathering. I had also presented the involved biomass data analysis for the geographical biomass assessment across the Nation.
- Presentation on biomass data submitted by various consultants and discussions at the central ministry as a part of the closure.
- Presentation at national GIS conference: Presented a paper on “A study to distribute crops spatially using Artificial Neural Network & Back Propagation with NDVI & Rainfall as crop parameters”
- I have been guiding graduate and postgraduate students for their projects on various applications as under:

Electronics

AMF
Load Panel Controller
Biomass Stove Battery Charger & Fan control
AGC
Adaptive Line Interference Suppression for Engine Control
Engine Cylinder Pressure Monitoring
Counter & valve sequencing for visualization
High energy ignition
Automatic Flame travel time recorder
Gas Tar Level Monitor
Load Panel Fan Controller
multi-channel FDM for Lamda recording
Data acquisition using Visual Basic .NET
VFD & Industrial Temperature control

Software

Web Service for Attendance
Web Service for Hardware & Software Maintenance
Document Manager
Web service to spatially locate Campus
NBPI Grid Coloring
Labview based DAQ
NI based DAQ Web & Standalone
Biomass Movement Analyzer
Major Biomass Mapper
Biomass Utilization Analyzer
Rainfall Dendrogram crop classifier

NDVI Dendrogram crop classifier
Spatial and Statistical data validator
River locator
Roads locator
Web service to spatially locate Rivers / Roads
Crop statistical analysis
Secured jpg transmission
Crop belt using soil analysis
Fuzzy distribution of Crops
Biomass proximity analysis along river belts
Biomass route optimizer

Mechatronics

Visualization for flow in sphere
Visualization for flow in Carburetor
Visualization for flow in calandria
Feed stock controller
Electrostatic precipitator as Gas Filter
Load Panel controller
Carburetor Controller
Automatic Door Controller

Earlier Experience:

[1976 - 1984] R & D on Cardiac Care systems

System development

I was involved in R & D on Cardiac Care systems at Electro medical division, LRDE [Presently DEBEL], Bangalore, part of DRDO. Exclusive development work done on optically isolated patient safe monitoring with computer interface won the Republic day award at LRDE. The systems were tested at CIL to go as a Technical knowhow to NRDC. I prepared the complete know how document for the cardiac care systems I was involved. I was also involved in the development of implantable demand pace maker which was tried out on dogs and then successfully on humans. Some of the other systems where I was indirectly involved in R & D were electro-sleep, auto BP monitor, telephonic transmission of ECG and DAQ using micro-controller.

I had lectured on pacemakers to Army doctors as a part of short term course to educate them on the types, electrical aspects, bio-compatibility tests, failure tests, post-operative maintenance & care and usage.

Software

During the same period I was involved in developing diagnostic software to detect about 30 critical cardiac diseases after interactions with cardiologists.

[1985 - 1998] Entrepreneurial activity

Industrial process design and production

I was engaged in Entrepreneurial activity in the manufacturing of professional grade PCBs with vendor approvals for ITI and DOT. I was both a technical and managing partner in establishing the industry on all aspects- selecting processes, selection of machines, making production layouts, training the people, customer interaction, vendor approval and execution. It enabled successful supply of the professional grade PCBs. The manufacturing facility included CNC drilling, conveyorized etching, Semi-automatic imaging, SMOBC and HAL. I had developed a simple cost effective BBT tester for GO-NOGO testing of bare boards. I had also developed CAD software for editing customer gerber plots to bring down investment & running costs there by providing security to customer data. The software also had the capability to do drilling pattern rotations, paneling and mirroring to suit CNC drilling. I had also built semi-automatic gold plating line to provide electronics grade gold on nickel for telephone key pads which was successfully used for the PCB production. Also developed carbon-graphite coated key pads and PCBs for Analog watches (gold plated).

Software

During this period, I developed software to input, verify and process the milk dairy data based on trip sheets from each of the collection centers to chilling centers for the district of Tumkur. The processing was involved in making weekly invoices according to variable tariff following certain logics. Necessary software was developed to analyze the milk supply in terms of quality from each center based on fat, SNF and COB data. It also generated quarterly and yearly analysis.

[1999 - 2000] Production of micro-controller based systems

Involved in design, assembly and testing of advanced micro-controller based electronic Indian musical systems. I introduced wave soldering and brought down the rejections by increasing the production. To support the production, suitable anti-static facilities were introduced by me to facilitate the assembly and testing with lowered rejections. I had also developed jigs to test speakers for different frequency ranges to meet the fidelity requirements. Some of the other solutions I provided were to remove interference and temperature dependencies.

[2001 - 2003] Part time consultant for a start up

I developed a home care and security system using micro-controller for a startup as a part-time external consultant. The home care and security had features such as raising alarms over phone for fire, gas leaks, power consumption and monitoring old aged. I had also guided the engineering team to develop central AC controller for telecom applications, Remote Electrical power monitoring & shut down, on line Power auditing and industrial controls. SCADA was developed using a microcontroller for these purposes.

Publications:

- G S Sheshagiri, Balsubramanya Raju, N K S Rajan; Web based geographical Assessment of Biomass under circle of Interest during NATIONAL CONFERENCE ON RECENT ADVANCES IN BIO-ENERGY RESEARCH on DECEMBER 7-8, 2012 at SSS-NIRE, Kapurtala, Punjab
- Ashwini Kumar B K, Indranil Kundu, G S Sheshagiri, N K S Rajan; A method to Assess and analyze biomass at State level as cooking fuel using efficient stoves during

NATIONAL CONFERENCE ON RECENT ADVANCES IN BIO-ENERGY RESEARCH on DECEMBER 7-8, 2012 at SSS-NIRE, Kapurtala, Punjab

- Balasubramanya Raju N, G S Sheshagiri, N K S Rajan; GIS Based RSD analysis for biomass based energy potential using a unique 'ray trace' approach during NATIONAL CONFERENCE ON RECENT ADVANCES IN BIO-ENERGY RESEARCH on DECEMBER 7-8, 2012 at SSS-NIRE, Kapurtala, Punjab
- Indranil Kundu, Rashmi N Raj, G S Sheshagiri, N K S Rajan; A methodology to assess Biomass geographically from irrigated areas during NATIONAL CONFERENCE ON RECENT ADVANCES IN BIO-ENERGY RESEARCH on DECEMBER 7-8, 2012 at SSS-NIRE, Kapurtala, Punjab
- Indranil Kundu, Kaviprabha N, G S Sheshagiri, N K S Rajan; Nation-wide Rainfall based geographical classification of Agricultural lands during NATIONAL CONFERENCE ON RECENT ADVANCES IN BIO-ENERGY RESEARCH on DECEMBER 7-8, 2012 at SSS-NIRE, Kapurtala, Punjab
- G S Sheshagiri, N K S Rajan, S Dasappa, P J Paul, Agro residue mapping for India, European Biomass Conference in Hamburg, Germany, Jun-Jul 2009.
- Presented the Mapping of bio-waste resources across India with an aim to introduce the methodology of formation of digital atlas, GIS [Geographical Information System], and assessed biomass information; using various aspects such as land use, NDVI [Normalized Difference Vegetation Index], GIS layers, demography, factor for power, crop-to-residue ratio, and also demonstrating the web biomass atlas for the country hosted at CGPL site to the faculty at KIT (Kalpataru Institute of Technology), Tiptur, Karnataka, India in Mar 2009.
- G. S. Sheshagiri, N. K. S. Rajan and H. S. Mukunda**,** CGPL, assessment of Biomass resource and its power potential using remote sensing data for Karnataka state and the nation in general, MGRIRED journal vol-1 issue no.1, march-2007, Bangalore.
- G. S. Sheshagiri, M. Dhinasekar, D. R. Anantha Deshpande, N. K. S. Rajan, A Study on Spatial Distribution of Biomass Resources Using RSD, in Map India Jan-Feb 2006 9th Annual International Conference and Exhibition in the field of geographic information, science, technology and application.
- N. Balasubramanya Raju, Sunil B. Inamdar, G. S. Sheshagiri, N. K. S. Rajan, A Fast Method for Obtaining Spatial Distribution of a Variant Using Dendrograms of its influencing Parameters using RSD, in Map India Jan-Feb 2006 9th Annual International Conference and Exhibition in the field of geographic information, science, technology and application.
- P. Rajeshwari, B. K. Ashwini Kumar, G. S. Sheshagiri, N. K. S. Rajan, A Method of Using Influencing Parameters by GIS based Intersections for Obtaining a Cost Effective Biomass Assessment using RSD, in Map India Jan-Feb 2006 9th Annual International Conference and Exhibition in the field of geographic information, science, technology and application.
- D. R. Anantha Deshpande, M.Dhinasekar, G.S.Sheshagiri, N. K. S. Rajan, GIS based Web Enabling of Nationwide Biomass Digital Atlas with Data Compression, in Map

India Jan-Feb 2006 9th Annual International Conference and Exhibition in the field of geographic information, science, technology and application.

- Sumer B. Dirbude, Sheshagiri G. S., N. K. S. Rajan, Experimental Analysis Of Feedback Control System for Lambda Sensor Based Producer-Gas Engine Carburetor, in March 2005 national Conference on Mechanical Engineering, NATCON.ME-2005, held at Ghousia College of Engineering [affiliated to VTU].
- Member of the publishing team for the book "Biomass to Energy- the Science and Technology of the IISc Bioenergy system" by CGPL, IISc, 2003.
- Surg-Cdr A. K. Deb, I. N. (Member), G. S. Sheshagiri and Y. M. Anandavardhana, An Application of Opto-Electronics to Bio-signal Processing, published in the Journal of the Institution of Electronics & Telecom Engineers- 1978.

Science related interests

Research on ancient Indian (Vedic) science- Astronomical calendar

Worked and researched under senior researchers and scholars during 1973-83 to re-design the vedic calendar with a graphical architecture where geometrical methods are adopted along with celestial charts to design the calendar. I have also assisted them to verify in their work of finding the dates of ancient Indian historical events. Presented papers in national seminars on vedic calendar. I am also an author/co-author for number of books published by ISIAC, Chennai on the related topics.

Research on experimental science education for children

I was responsible to set up a science club where limited number of children is taught for science and maths from grade 1 to grade 9 through practical experiments. This is being done since 1990 where many of these children are to-day successful engineers, doctors and academicians who acknowledge the benefits out of this science education. Such feed backs are being used to build effective teaching methods.