Smart India Hackathon (SIH) – 2018

Problem Statements

This list includes problem statements from:

1. All India Council for Technical Education (AICTE)
2. Council of Scientific and Industrial Research (CSIR)
3. Department of Defence Production, Ministry of Defence (MoD)
4. Department of Space (ISRO)
5. Department of Telecommunications (DoT)
6. Ministry of Electronics and Information Technology (MeitY)
7. Ministry of Railways (MoR)

All India Council for Technical Education (AICTE)

#AICTE1

Prediction of Admission & Jobs in Engineering & Technology with respect to demographic locations.

Application Software to estimate/forecast employment potential of Graduates/Post Graduates in different branches/courses (for short term and long term basis) by correlating data from various sources.

#AICTE2

Dashboard for all MHRD Initiatives & schemes.

MHRD has come out with many initiatives and also running number of schemes for different type of stake holders. In order to display the status of all Initiatives and Schemes on single window a Dashboard is required.

#AICTE3

Zila Vikas Manch (ZIVIMA) – District Development Portal.

A portal needs to be developed to facilitate district collector to upload the district specific problems, projects etc. The portal should be accessible to all the institutes so that the students can select the problems as their project work and submit solution in the form of report. The portal should have a provision for online interaction between district Authorities (respective department officials) and the concerned student group/Institute.

#AICTE4

Mobile App for Sansad Adarsh Gram Yojana (SAGY).

Under Sansad Adarsh Gram Yojana, the Hon'ble Members of Parliament are adopting villages for their overall development. The mobile app should be able display notifications, details of villages adopted, details of Hon'ble M.Ps, details of the institutions associated with the adopted villages, details of Program conducted & developmental activities initiated under SAGY.

#AICTE5

Smart editor: A tool for fetching and editing information from scanned document mainly image type.

A tool for fetching and editing information from scanned document mainly image type.

#AICTE6

Dashboard for all AICTE Initiatives & Schemes.

AICTE has come out with many initiatives and also running number of schemes for its stake holders. In order to display the status of all Initiatives and Schemes on single window a Dashboard is required.

Council of Scientific and Industrial Research (CSIR)

#CSIR1

Mechanism for prescribing drug in hospitals and its or its substitute availability in the medical shops of the area/city.

Every citizen of the country visit a doctor or hospital in his lifetime for different health-related reasons In order to treat the patient doctors prescribes drug which may be generic or unique which is purchased from a medical shop. It is often seen that patient has to visit several medical shops to fetch the prescribed medicine as he is unaware of different options for a drug salt available to him. Therefore an application can developed wherein the prescription from a doctor/hospital is digitalized and directly transferred to patient or caretaker who may have an app to assess the options and availability of the drug in the vicinity/ city.

This may require linking all brand names for a drug/ or it salt in a database which may be available to the doctor and the user. Simultaneously this database may be linked with availability of such drugs at different medical shops (based on the licenses issued by drug controller) which can be identified by a map. Due to large volume of data, initially a sample size can be determined and taken to calculate the match.

Sample Data Required, if yes, please describe: Yes

Name of CSIR Lab : CSIR – Central Drug Research Institute Nodal Person and Contact Details (Name, Designation, Mobile No. and Email): Dr. Anand Kulkarni, Senior Scientist, CSIR-CDRI Phone: 0522-2772459 Mob: 09451316745 Fax: 0522-2771941 E-mail: anand_kulkarni@cdri.res.in

#CSIR2

Computational approaches to understand corrosion mechanism under extreme conditions.

Corrosion is a worldwide problem which causes billions of dollar damage every year. Progress in corrosion sciences has helped in development of new materials and coatings which can withstand corrosion for years. However, corrosion mechanisms under extreme conditions (such as high/low temperature and pressure) are yet to be understood due to limitation of experimental procedures under extreme conditions.

Nuclear, aerospace, gas/oil, and chemical industries are major areas affected by such type of corrosion. Computational methods can be really helpful for this kind of problem. Using computational procedures, one can simulate various types of extreme conditions, for example, high/low temperature and pressure.

A combination of quantum chemical and molecular dynamic methods can give full insight of corrosion mechanism at atomistic level and rate of growth of corrosion under extreme conditions.

The work plan is divided as follow:

1) Determining mechanism of corrosion under extreme conditions
2) Investigation of growth of corrosion nuclei
3) Finding the factors affecting corrosion rate
4) Suggesting methods to reduce corrosion

Sample Data Required, if yes, please describe: Yes. Data is required to validate findings. This data can be collected from available literature.

Name of CSIR Lab: CSIR-Central Electrochemical Research Institute

Nodal Person and Contact Details (Name, Designation, Mobile No. and Email): Dr. Shekhar Hansda Scientist, Corrosion and Materials Protection Division CSIR-Central Electro Chemical Research Institute Karaikudi-630003, Tamil Nadu, India Phone: +91-7988616578, +91-8901709446 Email: shansda@cecri.res.in

#CSIR3

Smartphone App (Android) for providing agro advisories for medicinal and aromatic growers, enterprenuers and industries on plant disease/nutrient management, buyer/seller corner and market intelligence.

The cultivation of medicinal and aromatic crops can help in doubling the farm income. However, the growth of this agriculture sector requires intensive knowledge dissemination and hand holding of the farmers at various stages. CSIR – CIMAP is a premier research laboratory of CSIR, which is involved in multidisciplinary high quality research in agricultural, biological and chemical sciences and extending technologies and services to the farmers, entrepreneurs and industries of medicinal and aromatic plants (MAPs).

This smartphone app developed should aim to bridge the knowledge GAP between the farmers, entrepreneurs, industries and scientific fraternity in the areas of agriculture, processing and market availability for fuelling the growth of medicinal and aroma industry and rural employment.

This app should enable the user to capture the geo coded medicinal and aromatic plant related data to be uploaded in the central server, which, in turn can be used by the subject matter specialist (scientist) to provide suitable advisory on near real time basis. The app should also provide a buyer/seller corner with a moderator to provide a virtual platform for the buyers and sellers. It would help in removing the intermediaries and in turn increase the profitability to the farmer and industry.

The app should have feature to use the market intelligence data from the database, APIs of the market data available (open source or subscription based) on medicinal and aromatic crops to be made available to the farmers, entrepreneurs and industries.

Sample Data Required, if yes, please describe: Test data can be provided
Name of CSIR Lab : CSIR – Central Institute of Medicinal and Aromatic Plants, Lucknow
Nodal Person and Contact Details (Name, Designation, Mobile No. and Email): Name: Er Manoj Semwal Designation: Senior Scientist Mobile No: 09453049049 Email : m.semwal@cimap.res.in

#CSIR4

Web based Data Analytics software/framework for performing technology impact assessment of any CSIR technologies.

More often research problems in Indian R&D institutions are initiated based on top down instructions/directions that may or may not has relevance in terms of science, demand, resource availability as because technology developer and the actors associated with the life cycle works independently. The evolutionary model should ensure the marriage of Techno-Social System (Technology plus actors association) and technological regime (scientific rule sets plus resource constraints).

In order to do such assessments for any new technologies developed in CSIR institutions, for that matter in all R&D institutions, does not have in-house trained resources.

Preparation of new technology related plans, data collection, data representation, mapping to the socio-economical policies and regularities considering all kinds of effects, including second order effects, needs a software tools with certain degree of customization.

The proposed software should be web enabled, data could be collected, represented, analyzed online and results could be shared among all the actors in technology/product life cycle so that product/technology development and deployment shall be assessed and managed in accordance with social aims and expectations.

Sample Data Required, if yes, please describe: Students may be allowed prepare some sample data that could be imagined for a specific product as a case study. Alternatively, if sample data of such study performed for any technology may be shared for the development of software purpose.

Name of CSIR Lab CSIR-Central Mechanical Engineering Research Institute, Durgapur
Nodal Person and Contact Details (Name, Designation, Mobile No. and Email): Dr. Nagahanumaiah Sr. Principal Scientist Head, Planning and Performance Division Email: naga@cmeri.res.in nagahanumaiah@gmail.com Mobile: 9434181360

#CSIR5

Cost effective On-Cloud (Privately owned by government) solution for Zero-Day Attack Protection for advanced Persistent Threat/ Advance threat prevention for Government sectors.

Govt Offices and Research Institute networks are at continuous risk of target base cyber attacks, such as phishing, dangerous exploits, advanced Threats like sophisticated malware and zero-day threats.

Such attacks are risk to organization for their privacy and integrity of data and knowledge base To combat these Zero day attack or Advance Threat many security vendors have solutions such as Advance threat prevention/protection such as sandboxing which scans the files coming to network combines hardware-level inspection and OS-level sandboxing to prevent infection from the most exploits, malwares, zero-day and targeted attacks entering the networks These solutions are mostly based on Cloud-based Service or highly expensive On-premise appliances based solution.

It’s not the best practice to scan Government data for Zero day attack or Advance Threat on a third party cloud as files are uploaded and downloaded back and forth to vendors cloud for sandboxing .This raise the issues of data privacy and integrity as we are using cloud services of private vendors Therefore a Cost effective On-Cloud (Privately owned by government) solution for Zero-Day Attack Protection for advanced Persistent Threat/ Advance threat prevention must be designed so the government data can be sandboxed on

government owned private cloud itself for data as well as network security and can be widely used among different government sectors. 3. Sample Data Required, if yes, please describe:No
Name of CSIR Lab: CSIR- Indian Institute of Integrative Medicine
Nodal Person and Contact Details (Name, Designation, Mobile No. and Email): Name: Shaghaf Ansari Designation : Scientist, IT Divison Email Id: Shaghaf@iiim.ac.in Phone no: 0191-2569223

#CSIR6 [H]

Anti pilferage and anti adulteration system for fuel road tankers.

Pilferage and adulteration of gasoline, diesel and kerosene on fuel tankers en-route from terminals to retail outlets pose a major problem in downstream petroleum product handling. The tankers can be provided with fuel filling and drain valves/lids which are monitored online for the instant/location and duration of their openings. Driver is not supposed to open these valves/lids and should be opened only in case of emergency situation.
The online monitoring system with GPS shall reveal whether tanker has been pilferaged or adulterated en-route from terminal to retail outlets.
Sample Data Required, if yes, please describe: Pilot project can be taken up before mass implementation.
Name of CSIR Lab: CSIR-Indian Institute of Petroleum, Dehradun (To be carried out with collaboration from software developers, electronic laboratories and industries having expertise in on-line GPS based monitoring) 5. Nodal Person and Contact Details (Name, Designation, Mobile No. and Email): Wittison Kamei, Sr. Scientist, Mobile: 8126048681, E-mail: kamei.wittison@iip.res.in

#CSIR7

Smart domestic electric energy management system.

Every house has energy meter installed, however there is no mechanism or technology available for a programmable system which monitors and controls the energy usage pattern/trend for a house/building. Therefore, a smart energy management system which would enable the user to pre-program switching ON/OFF of electrical lamps and appliances based on user's requirement on daily/weekly/seasonal basis. A predictive feature in terms of energy-economy saving may also be added.
Sample Data Required, if yes, please describe: Not required 4. Name of CSIR Lab.: CSIR-Indian Institute of Petroleum, Dehradun
Nodal Person and Contact Details (Name, Designation, Mobile No. and Email): Robindro Lairenlakpam, Sr.Scientist, 9634272407, robindro@iip.res.in

#CSIR8

Risk assessment of fire hazard in coal mines using data analysis.

The energy derived from coal in India is about twice that of energy derived from oil. As coal is mined, there is always a risk of fire hazard at these coal mining sites. Hydraulic fluids are widely used in mining machineries. These hydraulic fluids are combustible and are used to transmit power and motion. Pressurized hydraulic fluids present a considerable fire hazard where ignition source is present. Mixing of hydraulic fluid with coal increases the risk of fire hazard in the mines. In view of the above, fire resistant characteristics of hydraulic fluids (Flame propagation, Spray Ignition, Auto-ignition Temperature etc.) needs to be experimentally studied under the simulated conditions. Data of experimental studies needs to be analyzed theoretically to assess the fire risk and to suggest preventive actions. 3. Sample Data Required, if yes, please describe: Experimental data on the fire resistant characteristics of different types of commercially available hydraulic fluids will be required for the theoretical risk assessment. 4. Name of CSIR Lab CSIR-Indian Institute of Petroleum 5. Nodal Person and Contact Details (Name, Designation, Mobile No. and Email): Mr.

Pankaj Kumar Arya Scientist Mob: 7060081020 E-mail: pkarya@iip.res.in

#CSIR9

Air and Water Quality Care System.

Real time data of various air/water quality parameters in the selected urban and rural area and the river flow (major Indian rivers) information will be extracted through web/cloud based tools. Based on the expertise developed by CSIR (CSIR-IITR) over four decades on air and water quality monitoring and assessment, data analytical methods will be developed to quantify source apportionment to protect human health and environmental pollution/quality.

A smart support system will be developed by collecting and comparing available past years data for those localities to provide preventive solutions. 3. Sample Data Required, if yes, please describe: Yes, Central Pollution Control Board (CPCB) and State Pollution Control Board, Ministry of Environment and Forest, Central/State water commission, and available air/water monitoring reports

Name of CSIR Lab : CSIR-Indian Institute of Toxicology Research, Lucknow

Nodal Person and Contact Details (Name, Designation, Mobile No. and Email)

Er. A.H. Khan, Senior Principal Scientist, 9451307490, ahkhan@iitr.res.in Dr. K.C. Khulbe, Senior Principal Scientist, 9453309900, kckhulbe@iitr.res.in Dr R Parthasarathi, Scientist Fellow, 07704994437, partha.ram@iitr.res.in

#CSIR10

An app that will give GPS-based Dengue Risk Index.A GPS-enabled smartphone owner can find the susceptibility to dengue infection at the location where he is. This will be of great use to all sections.

Dengue is endemic in tropical and sub-tropical climate zones. Transmitted to humans by the Aedas Aegyti mosquito, the dengue burden in India is increasing at an alarming rate.

The contributions of increased mobility, both of vector and human populations, urbanization and climate change are some of the most important variables to explain the recent increase in dengue outbreaks.

The Need

• Providing near real-time information about where and when to expect dengue epidemics is a need of the hour. This requires surveillance data, mobility patterns, spatial information from GIS and population and vector density data. Challenges Availability of surveillance data and data on vector density.

Desired Outcome

• The software can be customized to generate risk maps and location-specific predictions.

• Forecasting dengue hotspots and making fast predictions on its direction of spread.

• State-of-art mobile apps showing current dengue local hotspots in an area.

Sample Data Required, if yes, please describe: Surveillance data, GPS, mobility data (depends on the area) and population density data.

Name of CSIR Lab CSIR- National Institute For Interdisciplinary Science and Technology

Nodal Person and Contact Details: Dr. Elizabeth Jacob, Chief Scientist, eliz@niist.res.in 04712515264, 9495124564

#CSIR11

Visual Inspection of concrete structures by application of Image processing tools.

Visual Examination of concrete structures is the first step of NDE. Visual Inspection of structures are constrained due to inaccessibility, visibility, height, illumination etc. Drones can be deployed with onboard camera (visual/ thermal) and lighting to capture pictures from difficult locations.

The scope of the work will be to develop software tools to extract features from the acquired images and reveal information such as surface condition, crack pattern mapping , voids, delamination / spalling, sizing dimension measurement, etc. The methodology developed will help in carrying out rapid visual assessment of the structure.

Sample Data Required, if yes, please describe: Images from concrete structures with cracks/defects can be used to test the

developed image processing methodology, image stitching capability, dimensional accuracy, etc.
Name of CSIR Lab CSIR- Structural Engineering Research Centre, Chennai
Nodal Person and Contact Details:
Dr. P.Srinivasan Senior Principal Scientist, ACTEL, 9444076872 , sriniv@serc.res.in Dr. S.G.N.Murthy, Senior Principal Scientist, ICT, 9445179858, sgnmurthy@serc.res.in

Department of Defence Production, Ministry of Defence (MoD)

#MOD1

To detect anomaly in current ship trajectory based on historical data.

The maritime anomaly detection is very crucial in ensuring coastal security of any nation. The ships in sea follow a common route for a particular source and destination pair. The solution should detect anomaly, if a ship follows unusual trajectory which is different from the normal route followed by majority of ships.
Sample Data will be provided during implementation.
Users of this system: The tool will be used in Ship Navigation and Guidance solution.
Technology that can help address the issue: machine learning / Neural Networks.
Desired Solution: A machine learning algorithm is to be designed to extract the normal route from the historical ship movement data and to predict the class i.e. Normal or anomalous of any given trajectory.

#MOD2

Vision based algorithm for sensing of railway tracks.

These days the sabotaging of railway tracks has been causing immense accidents and loss of lives. Algorithm to be developed with the help of computer vision and Internet of Things based methods to detect any anomaly on the railway tracks.
The solution should comprise of sensors which can keep tab on the railway tracks and the consolidated picture can be seen at a local and global surveillance shelter. Besides sensor based surveillance the solution should also be camera based and video based surveillance systems to monitor the railway tracks and detect anomalies within a buffer area of the railway tracks. This solution should be able to identify/track railway tracks health index and any deterioration must be accompanied by alerts and alarms and the geo location of the tracks.
Sensors needs to be installed on the tracks and internet based surveillance of tracks shall be developed.
Users of this system: The solution will be used in sensing the railway tracks.
Technology that can help address the issue: Sensor integration / Cloud computing.
Desired Solution: The solution should be able to identify/track railway tracks health index and any deterioration must be accompanied by alerts and alarms and the geo location of the tracks.

#MOD3

Tool for Transformation of Geodetic Datum's (Coordinate Systems).

Geographic Information System (GIS) is used to store, retrieve and render the Earth-relative spatial data. GIS deals with flat map projections. Geodetic datum uniquely defines each location on Earth's surface with coordinates in latitude and longitude. Notable geodetic datum's are NAD27, NAD83, Everest datum and WGS84.
The coordinates for each point on Earth in one geodetic datum is different from other geodetic datum. For example, the latitude and longitude of a location in a Everest datum differs from NAD83 or WGS84. The transformation of one datum to other geodetic datum is known as a datum shift. GIS applications demand the support for more than one geodetic datum's for both vector and raster maps, hence the datum transformations or datum shift are often necessary.
Users of this system: The solution will help Geographic Information System (GIS) based

applications which requires different geodetic datum.
Technology that can help address the issue: Any high level Program language, Map data handling techniques.
Desired Solution: The geodetic datum's transformation tool should have a provision for input to take map data of one geodetic datum and convert into other geodetic datum for each NAD27, NAD83, Everest datum and WGS84.

#MOD4

Atmospheric Turbulence Mitigation In CCD/TI Videos.

Atmospheric turbulence can severely degrade the quality of images (video sequences) produced by long range observation systems, rendering the images unsuitable for vision applications such as surveillance or scene inspection.
The degradation arises from the complicated, random fluctuations in the refractive index of the air, caused by the fluctuations in temperature. Sample Data will be provided during implementation.
Users of this system: The tool will be used in video surveillance solution.
Technology that can help address the issue: Open source image processing libraries like OpenCV can be used.
Desired Solution : Restoring a scene distorted by atmospheric turbulence is the scope of the Project / Problem statement.

#MOD5

Real-Time image processing and forensic verification of documents.

The recent advance in the use of image processing applications has benefitted many areas including the forensic and digital verification techniques in cybercrime detection. At the same time the features of image processing techniques are used for producing digital evidence in criminal activities.
Image processing tools have been associated with a variety of crimes, including counterfeiting of currency notes, cheques, as well as manipulation of important government documents, wills, financial deeds or educational certificates.
Users of this system: The solution will help the document verifier/examiner find out and differentiate a fabricated document with an original one.
Technology that can help address the issue: Open source image processing libraries like OpenCV, AI techniques can be used.
Desired Solution: The solution should focus on the use of image processing tools for the examination of computer-manipulated documents. The altered documents once examined using a suite of currently available image processing tools should be capable of detecting computer-based manipulations of written documents.

#MOD6

Design of cyber physical surveillance system for smart cars.

Algorithm to be developed for maintaining secure communication for smart cars. Algorithm for situational awareness.
Cyber-Physical Systems (CPS) are integrations of computation, networking, and physical processes. Embedded computers and networks monitor and control the physical processes, with feedback loops where physical processes affect computations and vice versa. The economic and societal potential of such systems is vastly greater than what has been realized, and major investments are being made worldwide to develop the technology.
The technology builds on the older (but still very young) discipline of embedded systems, computers and software embedded in devices whose principle mission is not computation, such as cars, toys, medical devices, and scientific instruments. CPS integrates the dynamics of the physical processes with those of the software and networking, providing abstractions and modeling, design, and analysis techniques for the integrated whole.
These days the development of smart cars is on the rise. Self-driving cars equipped with sensors is in high demand in the research field.

Users of this system: The solution will be used for in vehicle communication and vehicle tracking application.
Technology that can help address the issue: Sensor integration / Cloud computing.
Desired Solution: The solution is to be developed for secure communications between sensors in the car as well as the secure communication between smart cars to prevent cyber-attacks on smart cars.

#MOD7

Prototype/application for whitelisting of USB devices in OFB which can be subsequently used on internet as well as on intranet.

USB white listing becomes essential for demarcation of pendrives/ external hard drives issued by organization and fit for use to handle official data. USB white listing can be done in such a manner so that same USB storage device can be accessed from any PC, server and laptop issued by the organization, irrespective of their connectivity to the internet or to the intranet.
It may also be ensured that the encryption mechanism remains standard and uniform throughout the organization. Outside systems should not be able to access such encrypted storage devices.
Users of this system: Users using pen drive to transfer data from Intranet to Internet & vice-versa.
Technology that can help address the issue: An integrated system that will provide MAC addressing based bulk whitelisting of storage media. It can be developed through java or any other API (Application Programming Interface).
Desired Solution: A prototype/application of national system for media access that will encompass standard policies/guidelines for media/USB device access control policy and data recovery can be deployed, preferably open source. There will be improvement in internal efficiency saving of time and effort as well as improved user experience.

#MOD8 [H]

Prototype/application for controlling wireless connectivity inside the premises.

Wireless connectivity can be detected by devices that support Wi-Fi connectivity such as laptops, smart phones, handheld devices etc. from within organizational premises.
If password is hacked/known unsolicited user(s) can access Wi-Fi from within the organizational premises. Mechanism for blocking of wireless connectivity is not known.
Users of this system: Every individual connected to the cyberspace in O. F. organization which consists of
i. User's who directly access the PCs of the organization.
ii. Server administrators.
Technology that can help address the issue: Stationary hi power sensor(s) that detect(s) Wi-Fi connectivity inside the premises and debar access is suggested. The system running on the hardware device/sensor can be developed through java or any other API (Application Programming Interface).
Desired Solution: Stationary hi power sensor(s) that detect(s) Wi-Fi connectivity inside the premises and debar access is suggested. A prototype is required to be developed for this purpose. This will ensure full assurance regarding implementation of MoD guideline of not permitting Wi-Fi within organizational premises.

#MOD9

Group Messaging Solution.

Evaluation of a group messaging solution between senior executives of a group of organizations and concerned ministry's workforce. The solution should be secure and only encrypted messages should be allowed, with no uploading of any file.
The solution should support Group conference. Development of a shared & secure messaging solution between Top Management of a group of organisations. Important discussions, plans can be discussed. Messages to be encrypted while sending & retrieving.
The Messaging server can be kept in ministry. The Messaging client can be installed on Top Management's Laptops.

Users of this system: Top management of relevant organizations and ministry's executives.
Technology that can help address the issue: A solution on the template of Google hangouts which can support group messaging between two executives as well as group messaging.
Desired Solution: A safe and secure professional communication between two people or a group of people when needed.

#MOD10

Common Portal for information sharing among Defence Shipyard PSUs.

The Finished Products as well as input materials of a group of organizations are more or less similar in nature. The resources, facilities, specialized skills are also common across the sector. Can we build up a common portal showing spare Resources, Facilities, and Workmen with specialized Skills, Materials with their detailed description, specifications, spare quantity, /unit Rate, and availability so that all Shipyards can go through that and instead of going for a new purchase through a new tendering process, can order it from another shipyard. Collaboration on sharing Inventory levels for excess items, Specialized Resources which can be shared in temporary manner among all relevant organisations.
Users of this system: A Single Nodal Officer and HODs of an organisation can access the portal. Nodal officer can upload the Data. HODs can access the data and determine their requirements.
Technology that can help address the issue: A portal which can be hosted on parent portal site and can be accessed by nominated Officers.
Desired Solution: Better utilization of idle inventory lying at different organizations , Better utilization of Skilled manpower.

#MOD11

Creation of Mail Dashboard

Outgoing Mails & Incoming mails to a particular Mail Id. Within this, segregation should be made between internal domain & external domain. Day/Week/Month/Year Wise reports should be available. Top 10 Mail Id's by No. Of Mail received / sent, Size of mail Boxes, Total size of Attachments sent / received should be made available. Inbound & Outbound Mail Analytics to be gathered and shown.
Users of this system: HOD (IT), Mail Administrator.
Technology that can help address the issue: A JAVA based in-house Portal can be made with a MYSQL database to store Mail Data.
Desired Solution : Better Management of Mail Boxes. Proactive monitoring. Detecting any suspicious activity.

#MOD12

Paper-Less Office

Even if Intranet and Internet application available in PSU computer users, but the usability and success rate is very less and resistive. Please forward 10 most effective ways to motivate users to use online applications for better digital India. Please also mention how to overcome resistance by different legal departments who always ask for ink signed hard copies.
Users of this system : All officers and computer users of our organization.
Technology that can help address the issue : All forms of digitization and computer technology to be used.
Desired Solution : Paper-Less Office

#MOD13

Digital Signature Verification in Local Area Network using ASP.Net & C#

The objective is to develop a digital signature program for authentication and signing of documents for internal use of the organization.

Problem scenario – I : Each user will be given his/her own eToken containing a digital signature corresponding to the user.
The application should have the following feature:
1. The application will have to authenticate the user using the public key of the user stored in the server. Java Applet or any other code segment which has browser dependability issue

cannot be used in the client side, the developer can make use of JavaScript for Client Side Code.
2. The server side code to be written exclusively in C#.
3. The application should make use of the private key stored in the eToken and there should be some encryption through the private key and decryption through the public key happening to authenticate the user.
4. The application should show a False if the logged in user and the inserted eToken DO NOT MATCH and the result to be True if the inserted eToken and the Logged In user is a MATCH.

Problem scenario – II : A word/pdf/excel document to be uploaded to the server should get signed on the fly whenever eToken is plugged in.
1. The application has to apply the user's digital signature on the document being uploaded and the fly. In the server the signed document will only reside.
2. Java Applet or any other code segment which has browser dependability issue cannot be used in the client side, the developer can make use of JavaScript for Client Side Code.
3. The server side code to be written exclusively in C#.
4. The document should be signed using the user's private key residing in the eToken. The signature on the document to be verified using the users public key residing on the server.

Users of this system: The users would be Employees of the organisation for digitally signing documents. The IT department of the organisation can deploy the Digital signature module in their applications.
Technology that can help address the issue: Digital Signature APIs available in ASP.NET.
Desired Solution : a)Authentication of the user using public – private key pair b)Digitally signing the document using private key.

Department of Space (ISRO)

#ISR1
Speaking Geo GP Assistant

Problem Statement:Speak and Listen to your Gram Panchayat Assistant in Indian Language. - Voice Enabled Applications improve the accessibility of the applications to different target groups, convenience and easy usage. In addition to this the support for regional language facilitates users to communicate and understand in their native language thus inviting a larger audience for application. - Government of India made an announcement mandating support for 22 Indian languages on all phones sold in India from July 2017 onwards -At Present only menu driven geo-portals are available to access the datasets, analyze a Gram Panchayat and generate plans for the development -This approach may reduce the accessibility & usability of the application and hence may miss a group of potential and intended users. Desired Outcome A Mobile Phone based software system which can listen and speak to the user in any one of the Indian Language and provides insights about a Gram Panchayat in GIS Domain. The Query and Responses related to GP developmental planning, to be implemented in the solution are as given below but shall not be limited to: - User: Go to Gram Panchayat Ambala. The Assistant navigates to Ambala on Map and responds – User: What is the Population of Ambala GP. The Assistant says that the Total Population is n. Male Population is n and Female Population is n. – User: What is the Area of Gram Panchayat. The Assistant answers n km2. – User: How many Schools are in Ambala GP. The Assistant answers n. – User: Which is the nearest school for the settlement Balapur. The Assistant answers XY School which is 1 km from the Balapur Settlement. – User: In education sector show me the gaps in Ambala GP. Assistant: Ideally 3 Schools should be there. There is a gap of one school. – User: Which is the optimal location to build the school. Assistant: Navigates to the location in the map

after successful analysis of the data. -The Above shall be in any one of the Indian Language Datasets Towards effective utilization of space technology & application for Gram Panchayat Developmental Planning and Monitoring, NRSC, ISRO with the collaborators has generated Satellite Images, thematic maps including drainage, road, rail, land use land cover and slope, etc, geo-tagged community assets at Gram Panchayat Level for the entire country. One complete set of datasets available within ISRO for a selected GP will be provided. https://nrsc.gov.in/hackathon2018/ Domain Automatic Speech Recognition, Natural Language Processing, Digital Signal Processing, Geographic Information System & Mobile Application Development Challenge Implementing Speech recognition techniques & App development in any one of the Indian local languages in GIS domain. Usage This will extend the reach of the solutions, built using Space Technology and Application for GP development. User Public, Decision Makers and Panchayat Raj Institutions Expected No. of concurrent users 500 Role of user -To explore, access and understand about GP -To analyze and plan for the development of GPs -To Monitor the Developmental Activities of the GP Technicality Technical Available solutions (if yes, reason for not using them) Not Available Domain Expert(s) Vijaya Banu. A, Uday Raj

#ISR2

Gram Panchayat Adoption Advisor

Problem Statement Analyze, Prioritize and Advise on selection of a GP for Adoption - Having proven successful stories under Saansad Adarsh Gram Yojana which promotes the citizens of the country to adopt a village and work along with the community at the grass root level towards development of the villages, Member of Parliament, Academic Institutions, IT Professionals, Industries, NRIs, NGOs and Individual volunteers are working to achieve the above mentioned goal in a participatory manner. -Currently the selection of GP for adoption is done manually. -Hence there is a need of an automated solution to rank the GPs based on various developmental indicators integrating the available datasets, enabling the volunteers to select a most backward GP for adoption. Desired Outcome -The Solution shall include (1) development of a novel approach to analyze the spatial datasets available for the GPs to understand the existing geographical, demographic, terrain profile and land-use pattern of the GP, agriculture & production practices, availability & accessibility of the basic amenities, opportunities in achieving sustainable development goals, access to rights and entitlements, literacy, health, hygiene, sanitation, natural resource, safe drinking water & sustainable livelihood opportunities, reach of ICT etc. (2) Development of GP development index (3) Ranking the GPs based on the indices towards adoption and (4) assess the developmental status & performance in implementation of welfare and development program. Datasets Towards effective utilization of space technology & application for Gram Panchayat Developmental Planning and Monitoring, NRSC, ISRO with the collaborators has generated Satellite Images, thematic maps including drainage, road, rail, land use land cover and slope, etc, geo-tagged community assets at Gram Panchayat Level for the entire country. One complete set of datasets available within ISRO for a selected GP will be provided. https://nrsc.gov.in/hackathon2018/ Domain Geographic Information System, Spatial Analytics and Data Mining Challenge Integration of available information from varied sources and developing a practical GP development index Usage This solution shall also be an input to comprehensive Gram Panchayat Development Plan. User Public, Decision Makers and Panchayat Raj Institutions Expected No. of concurrent users 500 Role of user -To explore, access and analyze the developmental status of a GP -To prioritize a GP for development – To analyze and plan for the development of GPs Technicality Technical Available solutions (if yes, reason for not using them) Comprehensive solution is not Available Domain Expert(s) Vijaya Banu. A, Uday Raj.

#ISR3

Text Extractor

Problem Statement Extract and Organize the regional text in the community assets Photographs -With an emphasis on transparency and accountability various ministries under Government of India have taken initiative of geo tagging the respective assets. While geo tagging the assets the latitude, longitude, photograph and other important attributes are being captured. -However, there is additional information of immense value embedded in the photographs in Regional Languages which are currently not used in decision making process due to lack of automated system for extraction & organizing the information embedded in the photograph. Desired Outcome -The Solution shall comprise an automatic (1) identification of the regional language. 3 Languages shall be attempted. English, Hindi & any one Regional Language of Team's Choice (2) detection and extraction of text within the images (3) Organization of the extracted info. in a structured manner & Linking with the geographic coordinates Datasets https://nrsc.gov.in/hackathon2018/ Domain Computer Vision, Image to Text Conversion (E.G) Optical Character Recognition (OCR). Challenge Automatic language identification, extraction and Organizing the information Usage To enrich the Community Assets Inventory which is an important input in Developmental Planning User Public, Decision Makers and Panchayat Raj Institutions Expected No. of concurrent users Extraction will be scheduled offline on the allotted directory of photographs uploaded by the user, during geo-tagging. Role of user -To schedule the execution of the automated solution on the allotted directory of photographs uploaded by the user during geo-tagging Technicality Technical Available solutions (if yes, reason for not using them) Not Available Domain Expert(s) Vijaya Banu. A, Uday Raj

#ISR4

Enable customized animation over the internet

Problem Statement ISRO has archival of time series of various satellite data in the form of time-stamped images. An efficient mechanism is to be developed to view an animation of time series of satellite data by the users is required. User can choose the start and end time / date and able to visualize its animation over the internet with different speeds of animation. Desired Outcome Customized animation over internet Datasets http://nrsc.gov.in/hackathon2018/animation Domain Software development Challenge Development of light weight animation over the internet with a smooth transition of images Usage Useful on ISRO web portals of Bhuvan, MOSDAC and VEDAS User Public and Decision makers No. of users 500 Role of user Customised Visualisation of animation Technicality Technical Available solutions (if yes, reason for not using them) Current solutions are not providing smooth animation for large number of images. Domain Expert(s) Shashikant A Sharma, Markand P. Oza

#ISR5

To design the transfer trajectory from earth parking orbit to halo orbit in the Sun-Earth circular restricted three body problem (CRTBP) using differential corrector.

Problem Statement Assume that a satellite is revolving around Earth in a 200 200 km circular parking orbit. Our objective is to transfer the satellite from the Earth parking orbit to Sun-Earth L1-halo orbit. Stable manifolds of halo orbits provide a natural way to transfer the satellite but it takes more time than the desired time and also does not pass to the desired altitude. Like by using manifolds the transfer trajectory takes around 328 days from Earth parking orbit to halo orbit. Hence it is desired to apply some other mathematical tool to design the transfer trajectory. Differential corrector with manifolds can be a suitable way to design the transfer trajectory. A circular restricted

three body problem model can be considered for this study. A transfer trajectory is provided in the form of data file. But this trajectory passes at an altitude of around 5100 km from the Earth surface. Hence it need to correct to pass at an altitude of 200 km to touch the desired parking orbit. Desired Outcome A mathematical tool to provide the L1 point halo orbit transfer trajectory. Dataset Provided Domain Interplanetary Trajectory Challenge Algorithm design Usage For Aditya mission User ISRO SATELLITE CENTRE, ISTRAC and other Space Agencies. Expected number of users 10 Role of user To use it for designing transfer trajectory to L1 point as a software tool Technicality Technical Available solutions (if yes, reason for not using them) Not Available with ISRO Domain Expert(s) Jai Kumar

#ISR6

To develop a mathematical tool for station-keeping of halo orbits with minimum fuel consumption.

Problem Statement Assume that a satellite is moving on a L1-halo orbit of Sun-Earth system in CRTBP. Due to perturbation forces satellite will not follow the reference trajectory as initial halo orbits are designed with simplified mathematical models. Due to this, satellite deviates from the reference trajectory path and to overcome this situation a station keeping strategy is required which can keep the satellite within the desired torus. So a mathematical tool is required to plane the maneuver strategy with optimal (minimum) fuel consumption. The reference orbit is provided in the form of data file. Actual orbit can be obtained by introducing some perturbations in the position and velocity of the satellite at some instant and then propagating the state in future by using the new perturbed state as the initial position and velocity. Desired Outcome A mathematical tool to provide the L1 point halo orbit station keeping strategy. Dataset Provided Domain Interplanetary Trajectory Challenge Algorithm design Usage For Aditya mission User ISRO SATELLITE CENTRE, ISTRAC and other Space Agencies. Expected number of users 10 Role of user To use it for designing transfer trajectory to L1 point as a software tool Technicality Technical Available solutions (if yes, reason for not using them) Not Available with ISRO Domain Expert(s) Jai Kumar

#ISR7

Efficient Indexing for Spatial-temporal Data in GIS Environment

Problem Statement Advancement of Location based services (LBS), IOT (internet of things) and ubiquitous computing devices and high temporal and spatial resolution satellite data acquisition has started flooding enormous data. In order to analyze these data in GIS environment, the challenge is for faster execution of complicated GIS algorithms and tools. There are many GIS tools which cannot directly handle large size spatio-temporal data due to limited memory. To handle large size data, first data is stored in database and then it is accessed by the GIS tools. Access is usually made faster by making indexing in the database. Efficient indexing technique for spatial-temporal data would in fact can reduce the execution time of these programs many folds. In GIS there are two kind of data- Raster Data (Images) and Vector Data (Geometry). Vector data can be of point, line and polygon. Indexing technique should be able to handle point, line and polygon. Should be optimized at least for point data. If possible, should be extendable to support Raster (Student may design different indexing technique for raster and vector data). Desired Outcome • A program library (or API) to create in memory spatio-temporal index on geospatial data. o Optimized for nearest neighbor and Intersection search in Space-time domain. o Should support multi-dimensional (dimensions excluding space and time) indexing • Example program in python (preferable) using the developed API and comparing the results o using spatio-temporal data with and without using index o using spatio-temporal data with respect to using RTree index (only spatial index) o using only

spatial data with and without index • using only spatial data with respect to using RTree index Challenge • Most of the spatial database have efficient indexing technique developed for handling spatial data and attribute data. Challenge is to develop single indexing for both space and time. • Most of the GIS tools are designed to access data directly from the source file like (tiff image, GML, csv or .shp file). Challenge is to design/implement in-memory indexing technique for spatio-temporal data, so that it can be directly incorporated into existing GIS algorithms. Datasets https://nrsc.gov.in/hackathon2018/ User GIS User doing analysis and data mining over spatio-temporal data No. of users Role of user Analyst Technicality Technical Available solutions (if yes, reason for not using them) Rtree (please refer link for details http://toblerity.org/rtree/) support spatial data type but don't support time. Domain Expert (s) Dr. Sameer Saran and Shri K Shiva Reddy

#ISR8

Optimal Connectivity of Unconnected Villages through Roads in Rural Area (Uttarakhand)

Problem Statement 1. At present there are so many villages in the country which are not connected with metaled roads. 2. For providing better road transport facility and to access village resources for economic development in a better way, the connectivity of every eligible village through all-weather roads is very much required. 3. Rural road connectivity is a critical component in the socio-economic development of rural India by providing access to amenities like transport, education, health, marketing, etc. 4. There is a nationwide centrally sponsored scheme of Ministry of Rural Development, Government of India namely 'Pradhan Mantri Gram Sadak Yojana (PMGSY) (http://pmgsy.nic.in)'. In this yojana, the officials of Ministry of rural development are selecting un-metaled roads between villages and nearest district/state highways as per the proposals of Gram Pradhan or block development officer but not using Technology for selecting these un-metaled roads (which are to be converted into metaled roads) for optimization of total road length and hence the government expenditure. 5. Geospatial technology has tremendous potential to tackle such road transportation networking problems. 6. This problem aims to connect all eligible unconnected villages (currently connected through kuccha/un-metaled roads) in the country through metaled roads in GIS environment. Desired Outcome 1. A GIS Tool of Minimum Spanning Tree Problem for optimal solution of PMGSY. 2. Customization of the above GIS tool with any open source GIS software. Optimal solution with respect to minimum road length along with proper connectivity of all unconnected villages with the nearest connected village or district/state highway. Challenge 1. Extraction of all Kachha/Un-metaled Roads from every unconnected village to other nearby villages or district/state/national highways using Satellite Data 2. Data design and editing for the solution of the problem. 3. Understanding the network algorithms and computer programming for connecting unconnected villages with metaled roads. 4. GIS Tool development in open source software using optimal network Algorithm 5. Testing and validation of results Datasets 1. https://nrsc.gov.in/hackathon2018/ (Example data of Road Network and Villages Locations) 2. http://pmgsy.nic.in (PMGSY guidelines) 3. http://bhuvan.nrsc.gov.in (Satellite Data) User 1. Officials of Ministry of Rural Development, Government of India are responsible for implementing PMGSY in the rural India. These officials need to identify the un-metaled roads between eligible unconnected villages and nearest connected village or district/state highways in order to minimize the total roads construction length and thus total government money. 2. The villagers are also facing many problems while travelling or transporting crops from their villages to other destinations/markets. No. of users Role of user Tool Developer and Analyst Technicality Technical Available solutions (if yes, reason for not using them) 1. Currently there is no

readymade solution for this problem 2. Few tools have been developed using network algorithm to find out the solution of minimum spanning tree problem over graphs. Domain Expert (s) Dr. Sameer Saran and Shri Hari Shankar

#ISR9

Location Based Services Offline Routing Mobile App

Problem Statement Location based services (LBS) serves to provide information to the mobile user based on their current location using onboard GPS on the mobile device. Mostly these services are provided online i.e. depends on the Internet and thus have limited use in case of limited connectivity. One of the desired functionality in such apps is identifying shortest path between two locations. Desired Outcome Android based LBS Mobile App providing routing functionality using any algorithm for computing the shortest path (based on distance) between two user defined points (locations). Challenge This project involves developing offline LBS mobile app (Android) using FOSS4G tools for finding shortest path. Datasets Sample dataset is provided. https://nrsc.gov.in/hackathon2018/ User No. of users Role of user Technicality Technical Available solutions (if yes, reason for not using them) Domain Expert (s) Dr. Sameer Saran and Shri Kapil Oberai

#ISR10

Garbage volume estimation using multi-view garbage photographs.

Problem Statement Garbage estimation specially at household collection center is time consuming task and requires human resources to manage the logistics. An automatic tool for estimating garbage from the uploaded garbage pics through crowdsourcing will be helpful for the swachh bharat app developed by IIRS(ISRO) for logistic management. Desired Outcome Real time total volume estimation from the sample garbage site through mobile app solution Challenge Image understanding to measure from unstructured data like image. How to extract volume from two overlapping photographs. Datasets https://nrsc.gov.in/hackathon2018/ User No. of users Role of user Technicality Technical Available solutions (if yes, reason for not using them) Domain Expert (s) Dr. Sameer Saran and Shri Ashutosh Kumar Jha

#ISR11

Content based Image Retrieval based on two themes i.e. burnt area assessment and water body in the order of similarity ranking (based on reference image) from large satellite imagery repository

Problem Statement Presently many satellite data centres have large number of satellite image repository and it is difficult to catalog them on the basis of different classes/themes. So it is imperative to develop algorithms in order to query them on the basis of themes and further rank them according to feature similarity Desired Outcome Rank all the input images on the basis of their similarity ranking w.r.t (i) burnt area and (ii) water body Challenge Storage of satellite imageries in the DBMS and along with image contents in the form of feature vector is a big challenge Datasets https://nrsc.gov.in/hackathon2018/ User No. of users Role of user Technicality Technical Available solutions (if yes, reason for not using them) Domain Expert (s) Dr. Sameer Saran and Shri P.A. Verma

#ISR12

Geofencing of data on NavIC/IRNSS signals

Problem Statement The Indian satellite navigation systems include the regional primary navigation system, NavIC and the augmentation system, GAGAN. These systems use message based signal structure, where every message transmitted is fixed in length and has its own identified message ID. Apart from carrying the navigation messages, the currently unused message IDs may be used for transmitting text

information for the purpose of disaster warning, location based services etc. Further, the information may be geofenced. A geo-fence is a virtual perimeter for a real geographic area. The use of a geo-fence is called geofencing. A location-aware device can be geofenced such that it is able to read and display a transmitted message only within a given defined boundary. This facility is disabled on the receiver exiting the geo-fence. This project involves development of framework for total end to end information flow with geofencing facility. It should include (i) the data structuring in the message, (ii) message priority estimation, (ii) selection of appropriate encryption, (iii) authentication techniques, etc. (iv) Further, a software module to be developed that identifies, decrypts and displays the text information, with a simulated structured message as input. The geofence boundary will be provided such that the decryption ability will toggle inside and outside of it. Deliverable A full fledge application which demonstrates end to end message dissemination in controlled manner. Datasets https://nrsc.gov.in/hackathon2018/ Domain Satellite Navigation services Challenge The challenge lies in proper selection of the key steps in designing a message structure, like data formatting, choice of encryption protocol, optimized placement of key elements in the message, etc. Also, precisely estimating the inclusion/exclusion within the geofence and enabling the key sensitive to the geo location is also challenging. Usage Dissemination of important information, to different categories of users based upon their locations. Therefore, key use will be for disaster warning applications and LBS. User ISRO,Strategic Users, General Public No. of users Role ISRO to validate the scheme for NavIC . Technicality Technical Available solutions (if yes, reason for not using them) Domain Experts Dr. Rajat Acharya, Atul Shukla

#ISR13

New Position Estimation Algorithm using range differences from satellites

Problem Statement Navigation receivers for GPS, NavIC etc. use known satellite positions and ranges from these satellites to receivers to determine its position and time. The current position estimation algorithm uses linearization technique for such estimation, which considers only first order variations of range and solves using iterative operation. Further, the ranges measured at the receivers are contaminated by the common receiver clock bias. This demands additional mandatory requirement of finding the clock bias while solving for position. A new algorithm for estimating receiver position may be developed which uses differences in ranges from different satellites to the receiver (rather than using absolute ranges). Differencing the ranges obtained from two different satellites at the same instant will eliminate the clock error from the variables used for estimation. The algorithm should (i) estimate the unknown receiver coordinates without any approximation, (ii) provide variances in the estimation process in terms of variances in range measurements. Datasets https://nrsc.gov.in/hackathon2018/ Domain Satellite Navigation Service Challenge The challenge lies in selecting the optimal way for handling the consequent three dimensional hyperbolic equations with minimum operations and without making the process computation intensive. Usage In the NavIC receivers, as an improved alternative to current position estimation algorithm User NavIC receiver designers (ISRO, Private Vendors, Academic Institutes) No. of users 20-25 Role of user To explore usage of Alternate PVT Algorithm Technicality Technical Available solutions (if yes, reason for not using them) Not Known Domain Expert Dr. Rajat Acharya

#ISR14

Estimating path profile of rain rate from point rainfall and total path attenuation data

Problem Statement Ka band satellite signals are highly attenuated by rain. For a satellite signal, extended from the ground receiver to the satellite, the total attenuation is the path integral of the specific attenuation (attenuation per unit length) along the path under the rain height. The specific attenuation profile, in turn, is dependent upon the path profile of the rain rate. However, it is practical to measure the rain rates at only one location. Since the rain rate is spatially variable, this point measurement of rain rate cannot be readily used for estimating the total rain attenuation for a signal path. The problem expects development of a statistical function for the path profile of rain rate as a function of the given point rain rate and the total rain attenuation over the path in a definite frequency. This may be done for any particular location of the satellite and ground receiver over Indian region. The expression for specific attenuation in terms of the rain rate will be provided. The event wise spatial variation of rain rate, available in the open sources may be used to obtain the directional spatial correlation for such modelling. Datasets https://nrsc.gov.in/hackathon2018/ Domain SATCOM Link Designing Challenge The challenge lies in appropriately functionalizing the direction and location sensitive rain rate profiles for given rain point rain rate and finding out the appropriate statistics. Usage By ISRO in modeling rain attenuation over satellite links for designing links for Ka band Satellite Communication systems. User ISRO, VSAT Operators No. of users Role of user To validate the model and use it in system design for Ka Band Satcom system. Technicality Technical Available solutions (if yes, reason for not using them) Not known Domain Expert Dr. Rajat Acharya, Dr. Randhir Singh

#ISR15

Distributed Panorama Construction of High Resolution UAV Imagery Using Public Compute Nodes

Problem Statement The raw remote sensing/optical imagery captured by UAVs almost always needs to be processed for generating a region panorama using image stitching. The image stitching procedure generally involves various steps namely: • Feature detection for finding correspondences between images so that they may be considered for alignment • Image calibration for removing optical defects such as distortions, chromatic aberrations etc. • Image registration that involves feature matching to determine optimal alignment features • Image blending that involves executing the adjustments figured out in the calibration stage, combined with remapping of the images to an output projection However, these images are typically of gigantic sizes due to which processing them takes a significant amount of time and hardware based computational resources. This leads to cumulative delays in preparation of the imagery data in a format that is useful for scientific or public use. Thus after determining those steps which do not have dependencies on the other steps of processing, the images can be divided into chunks of small size (say a few KBs) and these can be distributed among the devices owned by common people such as smartphones, or even desktops. An app/software will utilize the resources of the mobile or desktop to perform processing on the small image chunk and send the results back to the servers. At the server end, the processed chunks are assembled together to get the final output for that processing stage. Desired Outcome Panorama constructed from unstitched UAV images utilizing algorithms that have to work in a distributed fashion to produce the final image Dataset Unstitched UAV images acquired for the North East Indian region will be provided https://nrsc.gov.in/hackathon2018/ Domain Software development (app and

desktop based) Challenge Expansion of existing image stitching techniques to work in a distributed environment and formulation of algorithms for the same Usage Provides a very easy way of distributing the work/effort required to process huge UAV images. Saves on the IT infrastructure upgradation costs. Inclusion of the common people's resources in solving scientific problems giving the space research infrastructure unparalleled power and practically infinite resources. Can be extended to other image processing tasks like image segmentation/classification, interferometric analysis etc. User Common people/scientists Expected number of users 100 – 300 Role of user To download and install the app/software on one's electronic computing device like Android mobile or desktop PC so as to become a participating compute node that would do its part in contributing to the panorama construction Technicality Technical Available solutions (if yes, reason for not using them) None available for this problem domain in India Domain Expert(s) Dr. Dibyajyoti Chutia d.chutia@nesac.gov.in Shri Siddhartha Bhuyan siddhartha.bhuyan86@gmail.com Shri Nilay Nishant nilaynishant@gmail.com

#ISR16

Formation Flying Simulation for UAV Image Acquisition with Real Time Control

Problem Statement Currently remote sensing imagery gathered by UAVs, drones or other low altitude unmanned flying vehicles suffer from some limitations like: • No redundancy – only one vehicle used to acquire images. If it fails then the whole activity is rendered useless • Resolution/image capture range limited to view capabilities of vehicle i.e. the vehicle can only capture images of a fixed maximum area say 1km x 1km • Inability to view targets from multiple angles simultaneously in a single flight • Manual control is restricted to line of sight operation i.e. the vehicle can only be controlled if there is an unobstructed line of sight between the vehicle and the controller To resolve these problems, we can devise a system that incorporates multiple UAV vehicles in a master slave fashion (only one master, any vehicle can be assigned as master). Following are the details: • Redundant operation is possible due to presence of multiple vehicles even if one fails, then others are there to act as backups • High resolution possible due to combined resolution of master and slaves (by maintaining fixed/variable separation) that is to say where one vehicle could only capture images of say 1km x 1km, multiple vehicles together can capture 1km x 5km thus increasing the range of image capture as an example • Multilook/Multiangle acquisition possible for given targets i.e. the same target can be simultaneously photographed from more than one angle. This can help in 3D image generation • In case the master (or for that matter any of the vehicles) goes out of line of sight control during manual operation due to presence of trees/buildings etc., then another vehicle (in LoS) can be made the master and the 'unreachable' vehicle can be controlled through the new master Desired Outcome A UAV formation flying simulation that can address the above mentioned limitations of single UAV operation and perform a successful fly through over a given area Dataset SRTM or ASTER digital elevation maps can be provided for a given region to generate the terrain over which the formation flying simulation is to be carried out (https://nrsc.gov.in/hackathon2018/) Domain Software development (desktop based) Challenge Formulating a technique to arrange and operate simulated UAVs in a master slave fashion Usage Massively increasing the capabilities of UAV image acquisition process. The same concept can be extended to satellites if a software simulation proves valid (of course with certain constraints). Generation of (stereo) 3D object maps using multi-angle image pairs (currently not available) User Scientists Expected number of users 100 Role of user Use the software to propose actual UAV firmware that can perform the desired outcome in the field Technicality Technical Available solutions (if yes, reason for not using them) None

available for this problem domain in India Domain Expert(s) Dr. Dibyajyoti Chutia d.chutia@nesac.gov.in Shri Siddhartha Bhuyan siddhartha.bhuyan86@gmail.com Shri Nilay Nishant nilaynishant@gmail.com

#ISR17

IP Data Analysis and priority queuing

Problem Statement SATCOM networks operate on proprietary data formats, protocols being used by different vendors. In order to effectively utilize the network during emergency, we need to analyze the data after demodulation and isolate the various types of traffic namely voice, video and data. Subsequently we also need to prioritize the data at which is being fed to the VSAT modems as per flexible set of rules, e.g. the voice being given maximum priority, the private data being next and then multimedia data. Data rate surge in low priority services should not affect quality of high priority services. Desired Outcome Software with two features a) analysis and isolation of voice, video, other data from network stream b) priority based multiplexing of voice, video & data from various sources Dataset https://nrsc.gov.in/hackathon2018/ Domain VSAT Communication Challenge Analysis of the received data post demodulation and isolating different types of traffic. Subsequently designing a lightweight gateway software which can decipher/analyze data from multiple sources and assigns them priority as per flexible set of rules which can be changed by administrators. Usage VSAT analysis & monitoring applications, VSAT Hub User VSAT Networks, Strategic user groups Expected number of users Role of user To validate the software and adapt the same for various applications. Technicality Technical Available solutions (if yes, reason for not using them) Domain Expert(s) Chandra Prakash, Narender Kumar

#ISR18

IP based multimedia & data communication

Problem Statement In MSS/VSAT Networks a communication software is desired with adaptive codec based voice/video calling feature (adaptation depending on link quality) & that could support voice communication at 2-3 Kbps (including all overheads) while maintaining voice quality of 3-3.5 MOS. In addition to above, the software should also be able to interact with other applications such as browser/e-mail/FTP/messenger etc. at network layer and communicate with VSAT modem using fixed sized packets over Ethernet. Desired Outcome Software with two features a) voice (including low data rate 2-3 Kbps) & video calling b) Interfacing with standard network applications with data segmentation & reassembly Dataset No data will be provided Domain MSS & VSAT Communication Challenge Building application for multimedia & data communication which takes care of segmentation & reassembly of IP packets with minimal overhead and have end to end signaling built into it. Usage MSS & VSAT user applications User MSS & VSAT Networks, Strategic user groups Expected number of users Role of user To validate the software with field trials and adapt the same for various applications. Technicality Technical Available solutions (if yes, reason for not using them) Domain Expert(s) Chandra Prakash, Narender Kumar

Department of Telecommunications (DoT)

#DOT1

The present guidelines of DoT HQ do not allow more than nine mobile connections to an individual.

Thus, it implies that even the connections have been obtained from different Telecom Service Providers (TSPs), the cumulative count should not exceed nine. Since there is no connectivity among the different TSPs' subscriber databases therefore the TSPs are bound to limit the query

within their own database to ensure that the new connection which is going to be activated does not cross the above count. There is no mechanism with TSP to check the no. of connections working for that individual with other TSPs. Expected Outcome An app and web application may be developed through which anyone can query the combined mobile subscriber databases of all the TSPs in a Licensed Service Area (LSA) so that- (i)Any citizen can know the list of mobile connections working against her/ his Aadhaar number in an LSA. This information should be provided in an authentic manner only to actual Aadhaar allottee. (ii) DoT can know the list of mobile connections working against a particular Aadhaar number in an LSA. The application should also be capable of generating the list of those mobile connections, count of which are more than a specific number for a particular Aadhaar number. Additional Information DoT requires each TSP to provide mobile subscriber data in a predefined format at regular intervals. Thus, solution to this problem should consider merging data from all the TSPs

#DOT3

To develop App and SMS based application which can measure the received mobile signal level at any location.

...and present the same in pictorial format to the user so as to assess the Quality of service in that location
(i) Pushing and aggregation of the information collected as above to a central location so as to get a meaningful coverage quality measurement for different TSPs and will generate a feedback regarding mobile network QoS.
(ii)The app shall have feature of functioning in offline mode and data shall be pushed to server when the coverage is available. Expected Outcome: Licensor/ Regulator and finally the TSP's can take proactive measure for network quality improvement based on the feedback of common man.

Ministry of Electronics and Information Technology (MeitY)

#MTY6

Masking user details on the mobile while transacting And Establishing if a cardholder is shopping from a recognised payment device

The primary concern from a corporate governance perspective is that personnel conducting work in these non-production environments are not always security cleared to operate with the information contained in the production data. This practice represents a security hole where data can be copied by unauthorised personnel and security measures associated with standard production level controls can be easily bypassed. This represents an access point for a data security breach. To protect data that is classified as personal identifiable data, personal sensitive data or commercially sensitive data, however the data must remain usable for the purposes of undertaking valid test cycles. It must also look real and appear consistent.

#MTY17

Create an app that can run on a Windows/Linux based desktop to aid the disabled persons to perform day to day tasks

General Problem Statement : The disabled (blind) persons currently need support to start the PC , login their user id and passwords and then the access to certain browsers to do browsing. We must try to resolve this problem. Users: Disabled (Blind) persons for reading / browsing / performing word documentation. Technical Solution : Create the service in windows that listens to the finger print sensors and if the sensors match to the PC owner, allow the person to login and immediately start listening to commands as the blind person will not be able to see the next window / or won't be able to open something. Desired Solution : i. The app must begin as a service that shall run in the background. Allow to register the disabled person with one time help from non-disabled

person. ii. The service must be integrated with figerprint sensors and must be able to validate the fingerprint of the disabled person and allow the access of this person to the app. iii. The service upon successful logon immediately allows you to start sending the commands that allow the blind person to perform web browsing iv. The service must allow to start accepting the commands to perform ms-word document. v. The service must be generic to accept new interfaces like using read out loud feature in pdf to open and read a pdf and integrate / operate the other windows applications

#MTY18

Accounting and Payment release process of ESDM Scheme being manual and time consuming as steps involving multiple stakeholders and high number of touch points

After successful completion of ESDM examination, training partner raises bills in physical claim format along with hardcopy SC/ST/EWS certificate and also hardcopy ESDM certificates. All these hardcopy documents are manually scrutinized and verified by consultants and a file is prepared for payment which is highly time-taking and cumbersome process. This payment file passes through different touch-points for verification which ultimately delays payment process. Need process reengineering, followed by automation of workflow.

#MTY19

For online Job Applications received by NIELIT, the credentials of Candidates (if available on Digital Locker or any other repository) should be verified instantly online.

While applying for different recruitments through online application softcopy uploading of documents like educational qualification, D.O.B proof, category certificate etc. of candidate is required. This result in unnecessary utilization of server space as each application requires approx. 2MB storage space and thousands of applications are received. If credentials are verified then & there at the time of application receiving (uploading), it will be beneficial for all stakeholders. Integration solution with generic interface is needed.

#MTY20

Development of a vulnerability scanner

The vulnerability scanner should automatically parse through the APIs to identify which ones may be exposing the system to danger. A vulnerability database is the list of known vulnerabilities the scanner will use to spot potential problems the more information the scanner has, the more accurate its performance. Once a team has a report of the vulnerabilities, developers can use penetration testing as a means to see where the weaknesses are, so the problem can be fixed and future mistakes can be avoided. When employing frequent and consistent scanning, one will start to see common threads between the vulnerabilities for a better understanding of the full system.

#MTY21

Computerized Application for Paper-less Examination Screening (CAPES) system for recruitment

i. A large number of Job Seekers have to apply for various posts and appear for examinations at specified locations on a particular date and time. ii. Job Seekers have to spend considerable funds, time and efforts to reach the examination centers and personally appear in examinations. iii. Many a times, job seekers are not in position to travel due to various reasons like non-availability of railway tickets, examination centers are far off or are not able to afford the expanses towards appearing in exam. iv. Due to socio-political situations like Bandhs, Strikes, Road block or riots etcs, the job seeker is unable to reach the examination centers Uses Of Proposed system are Many Fold : i. Looking at various difficulties faced by Job Seekers and availability of Internet connectivity

a web based centrally controlled SW solution with a mobile app can provide a better, cost effective and easy solution to both job seekers as well as recruiting agencies. ii. Similarly, the recruiting departments have to spend lot of money and efforts to process large number of applications, arrangement examination centers, supervisors, invigilators and so-on to carry out the activity. By having web based solution lot of time, efforts and money can be saved. Technology To Be Used: i. Open Source Technology can be used to create a web portal wherein the job seekers can apply for a particular Job and a application Id is assigned to the applicant with on-line verification carried out using Aadhar number and registered mobile number. ii. Various alerts and e-mails are sent to applicant by system based on activity performed. iii. Smart Phone based mobile app be created where the applicant registers with assigned id as well as Aadhar Number for the purpose of authentication. ICT Based Solution: i. A strong MCQ (Multiple- Choice Questions) data bank related to proposed job is created on central data base by experts and answers are also stored in data base tables in encrypted format. Each MCQ should be stored in matrix with defined time to solve each question. ii. During the period of examination the mobile app should be connected to central data base. iii. Android base app should be developed to enable job seekers appear in examination from anywhere and any time (During the period lines are open). iv. Number of users , no of web pages and transactions volumes can be assessed and scaled based on type of job and expected number of applicants. v. A well-defined, configurable application can help in fully ICT based solution and productize the same.

#MTY22

Automatic Information Collection System (AICS)

It has been observed that critical piece of information desired by leadership is scattered across various Groups /Divisions /Organisation of MeitY. Manual collection, compilation and consolidation are time consuming exercise. As the above process is manual and it requires huge amount of man hours for mechanical tasks such as circulation, follow-ups & reminders, compilation, consolidation, submission for approvals, and responding back to outside Ministry. These huge man hours could have been utilised for better productivity. In view of above, it is felt that an automated system for Information Collection may be designed to address the above challenge. i. Coordination Division of Ministry looks after the task of collecting, consolidating, and responding the critical piece of scattered information lies with various Groups/Divisions/Organisation of MeitY solicited by other Ministries/State Government. In order to ensure smooth flow and availability of information, Coordination Division ensures synergy and coordination among various Groups/Divisions/Organisations of MeitY. ii. The existing process is more of manual process which requires a letter to be circulated to all concerned either through email or through hardcopy seeking information available with them w.r.t. their functions. Based on the responses received from various Divisions, Coordination Division consolidates information, submit for approval and communicate back to external Ministry/Department who sought information. iii. As the above process is manual and it requires huge amount of man hours for mechanical tasks such as circulation, follow-ups & reminders, compilation, consolidation, submission for approvals, and responding back to outside Ministry. This huge man hours could have been utilised for better productivity. iv. Details of AICS is given as under – 3. Why AICS (forms)? i. The need for speed – In the recent cases it has been observed that critical piece of information desired by leadership is scattered across various Groups/Divisions/Organisation of MeitY. Manual collection, compilation and consolidation are usually a time consuming exercise. ii. Increasing Productivity – Having a process in place will help in increasing productivity and with existing manpower. iii. Reduced paper work – Forms help in

eliminating the emails and the mess of files and provide secure storage, access, track, and share of information quickly and easily within organisation. iv. Forms can exchange data within organisation, which allows for merging the data with an existing record or using the data to create a new record and automatically alert you to what needs to be captured for all users. v. Forms can be traced. The current state of a form that is being processed can be determined and accordingly reminders to expedite can be sent quickly. vi. By utilizing forms, PUCs, scanned documents and electronic documents will automatically route to the appropriate Groups for review and approval. This accelerates processing, improves visibility and accountability and streamlines manual and time consuming process. vii. Information pertaining to MeitY can be effectively managed in forms repository within the system where it can be accessed securely at various level of top leadership for strategic use. System Architecture 4. Forms 4.1 Admin (Coordination Division) Forms i. Dynamic forms may be created based on the nature of information (could be a table, a text write-up, ppt etc) solicited from different Groups/Divisions/Organisations ii. Admin (Coordination Division) should have facility to design the form in the specific format in which information is sought. Possibly in word, excel or in paragraphs with predetermined document structure. iii. Admin should have facility to upload the letter/PUC (PUC – Paper under consideration) online. A text box to write the context of the information. iv. System should be capable of generating unique form no and shooting emails to officers concerned of MeitY upon submission of the form by Admin. Email ids can be pre-loaded/modified/updated. v. Admin should have facility to accept/send back the inputs received from various Groups/Divisions/Organisations 4.2 User (Groups/Divisions of MeitY) Forms i. User should be able to log into forms based on the Form No. which was sent to them through a notification email by Admin. ii. Users are allowed to fill the information as per the prescribed format designed by Admin. iii. Users should also be given option to upload (based on the design of form by Admin.) iv. User should be given facility to send NIL information also with one click. v. Users should be able to modify their inputs later on before the due date (as specified by Admin) vi. Users should be submitting their forms to their respective Authroity, separate access controls will be provided to GCs and HoDs of every Group and Divisions. vii. Authority (GCs) to approve the forms and the same will be reflected to Admin (Coordination Division) 5. Workflow i. Admin to upload the form based on the nature and quantum of information sought from users. ii. Upon receiving email alert from system, user will need to fill the information in the form generated from Admin. iii. Upon completion of form, user should submit the form to Admin. Further, Admin to accept/send back, generate report and submit for further approval to approving authority. iv. The system should send alerts at all levels including user, admin and approving authority, eliminating the need for any reminders and follow-up with personal meetings. v. The completed e-forms once approved are then stored in the form repository in the system for retrieval when necessary. 6. Access Control 6.1 Admin i. Admin should be able to create new forms based on the requirements. ii. Admin access may be designed for Coordination Division who will have rights to upload, and download the consolidated information from specific forms.

#MTY23 [H]

Retrofitting of existing vehicles for converting to Electric Vehicle (EV)

Driven by the enormous challenge of reducing oil dependence in India for transportation and also curbing environmental pollution from vehicle emissions in metropolitan cities, rapid adoption of alternate green technologies for vehicles on road is now seen as inevitable. The government's vision for complete conversion to electric vehicles (EV) by 2030 has provided entrepreneurship opportunities to innovate

affordable ways for converting existing petrol and diesel cars into electric cars. The conversion of old vehicles into electric vehicles through retrofitting has already been allowed by the Central Government through official notification. Since an EV has no internal combustion engine, the conversion process involves removal of majority of the vehicle parts related to the fuel combustion system and installing suitable electric powertrain and other systems for better efficiency and reduced travel cost. The challenge is to develop intellectual property (software and hardware) and off the shelf components to create high performance and high efficiency retro-fit kits for existing vehicle models on Indian roads. Advancements in systems integration engineering, controls, battery, electric motor and power electronics technologies have created an opportunity for small and medium scale technology companies and start-ups to design solutions to these problems. With cost of technology, batteries and renewable energy coming down, the solutions can become viable for even mini- and mid-segment car owners. Affordable retro-fit solutions along with their low maintenance costs could trigger mass adoption by both private and commercial vehicle owners in the country.

Ministry of Railways (MoR)

#MOR2

Passenger Security

Security of passengers and their belongings is of paramount importance for Indian Railways. In case of any untoward incident or incident of crime against passengers and their belongings matter can be reported to Government Railway Police at Railway stations and on trains and also through given security helpline telephone number 182. A software solution needs to be provided for online registration of FIR over entire network of Indian Railway for speedy initiation of action by GRP.

#MOR4

Management of Railway Rest Houses & Holiday Homes

At present, the allocation of accommodation in Railway Rest Houses, Holidays Homes is done manually. The request is to be given in writing and there is no mechanism to advise the applicant about status of booking of rooms. This causes uncertainty and difficulty in planning one's programme. An online system of submitting request and allocation of rooms is required.

#MOR5

Development of onboard digital fuel gauge for power cars for fuel monitoring

At present, analogue type of fuel gauge of high least count is provided on the fuel tank in under frame which needs to be improved upon for close monitoring of fuel consumption. It requires development of digital fuel gauge for accuracy of measurement while train is on the line.

#MOR6

Drone/Robot based system for cleaning between tracks

It is seen that waste is strewn in station yards and along the tracks particularly in populated areas. Picking up the waste manually is time consuming and also poses safety risk. A Drone/Robot based system for cleaning between tracks needs to be developed.

#MOR7

Maintenance of Coaches & Wagons

Coaches and Wagons are maintained as per schedule in nominated depots. The availability of complete profile of each coach and wagon at a centralized data base and its analysis can help in generating useful information about the causes of breakdowns, likely failures in future in specific coach or wagons and thereby enabling planning for maintenance.

#MOR8

Telecom Connectivity

Indian Railways have telecom connectivity through RailTel OFC network, BSNL etc., for reserved ticketing counters, Unreserved ticketing counters, freight operations information system terminals etc., across the country. The uptime of telecom channels is monitored through network management system. A software solution to monitor the telecom channels, analyze the status or performance of various channels and prevent failures can help in improving performance.

#MOR9

Involving Passengers in Upkeep of Railway Stations

Railway stations are used by two categories of passengers – daily commuters and occasional travelers. Involving passengers in station upkeep through education and active participation can help in finding a lasting solution. Software to keep people engaged about the need to maintain the railway stations is required.

#MOR10

Machine reading of content of customer feed back

Indian Railways has online system of customer feedback in suggestion. Customers can give their feedback on website, mobile application as well as through social media. Since the number of feedback is large, machine reading of the content and classification among various departments, zonal and regional offices can help in quick transfer of such feedback to the concerned officials for immediate redressal. A solution need to be developed for such a utility.

#MOR11

Public address system

It is observed that the announcements from public address systems at railway satations are at times not audible. It may be due to train noise, crowding at the station, technical defects in the public address system etc. A solution needs to be evolved so that the passengers can listen to such announcements clearly on their personal devices like mobile etc.