Notes on CHS (Community Infrastructure for Health and Safety) Network Development

mjd v1.1 25.feb.21

[Here I have intentions to complete one or more diagrams that illustrate the basic relationships in this "newe reformulation" of what we have been doing with MedAtrium, Eyrie, BioProt, and also VESID, and how these fit together as what we call "CHS". Also in the picture are components from prior projects that include IntelAgros (smart farming and energy for rural and disadvantaged areas), SELDON (prediction engine algorithms) and ASTRIC (cooperative remote and environmentally challenged robot teams). However, these diagrams will come later – many small last-minute things to do during these remaining days in USA.]

I. Overview (23.Feb.2021)

Goal:
Providing a virtually turn-key IoT environment for both acquisition and delivery of multi-attribute data pertaining principally to health and safety parameters for individuals and their immediate physical environments (e.g., individual vital statistics, residential/workplace datapoints, administration of personal biomedical instruments). This enables the aggregation of sensor and actuator data streams from an open-ended variety of different sources and specific technologies, some of which may be quite divergent from the classes of data that are usually considered within the contexts of (for instance) health and safety, such as pertaining to home energy devices and general appliances.

The resulting data is processed through diversified and independent analytical functions in order to produce relevant information that is useful for both individual users and professional service providers, in delivering different services (e.g., health and safety alerts and directives, medications, tracing and tracking, resource allocation). The system is able to draw upon the different available sources and also direct inputs from individuals, which include data often not available through the usual channels (i.e., specific apps that are "hard-wired" to specific devices such as wearables or home appliances). This enables more diverse and adaptive intelligence to be developed that can draw upon the open-ended diversity of these sensors and actuators.

The resulting information can be utilized by two broad groups:

- general population - everyday persons – for their choices in matters of health, nutrition, and environmental action including home energy functions and also emergency response. The aim is to serve all types of people and with an emphasis on those who are not active and fluent with computer and internet technologies (this is a large subset and not restricted to any particular segments)

- professional users who are involved in the production, management and supply of critical resources and services (e.g., diagnostic tests, mobile placement of emergency equipment, vaccinations and other medicines, or services such as energy and water utilities), both on a regular community basis and for emergency/extreme situations (e.g., pandemics, floods, storms, other situations).

The overall architecture will inherently preserve privacy and anonymity while enabling appropriate access to both individual and collective data streams.

This supports the objectives of a system such as has been outlined previously as Eyrie (see some remarks and white-paper material at www.intelrenaissance.com) and also many of the key motivations and design features of OASIS (aka "Terra"; see www.oasis.tdyn.org). It supports the objectives of what has been described as CHS (Community Infrastructure for Health and Safety; see also www.intelrenaissance.com). The aim is to do so in a manner that can be delivered through communication and computing environments that are already very widely in place and in use within the mainstream public community (e.g., the basic common internet, web services, and mobile devices). There is a deliberate intention to integrate data acquisition with community social interaction of the type that has been demonstrated, in what we will call a "paleo-internet" communication form, within various social media constructs that have been widely used especially in the first two decades of the 21st century.

Such a system architecture can and should have appeal and utility for very diverse groups and needs, and not only be "specialized" for one set of users or one class of problems (e.g., viral pandemics). In a way, we are talking here about creating a kind of "socially-diversified, multi-tasking "meta-operating system" that can be used for many different situations, including as an underlying "core" component for the type of radically different social communications that have been described previously as OASIS (Open Autopoietic Social Intelligence Synthesis; see www.oasis.tdyn.org), wherein purposive and meaningful social dialog and exchange replaces previous "noise-blog" chatting and wherein constructive, functional individual and group media content replaces previous "virtual reality worlds", all of which had emerged and grown to be dominant presences within internet media and social communications following the 1990s and early 2000s.

We are stating that the organic and systematic integration of large-scale, open-architecture IoT, providing bidirectional data pathways for many different personal, home, workplace and transit devices (such as personal wearables and home/vehicle monitoring and signaling devices) with social communications that emphasize the "COMEET" principle (Communicate, Collaborate, Make, Educate, Entertain, and Trade) among users, provides a very solid pathway to serving people and organizations with what they need in both normal and extraordinary situations.

This approach can enable the achievement and controlled management of something with unique and as-yet-unachieved information and knowledge that is of value to both the public and private sectors, including the commercial sectors that depend upon both knowledge and outreach capabilities (e.g., advertising) to reach consumers. Up until now, the path pursued, as evidenced by the dominant players in the social media domain ("Big Tech" such as Google and others), has been to saturate consumer-users with advertising and increasingly, to manipulate those same populations in ways that will serve thee advertising and "market-control" ambitions. "Click-bait" techniques, combined with

what amounts to being very regimented and highly constrained and pre-motivated “artificial intelligence”, are designed and employed to classify user populations on the basis of what are their apparent interests, trends, etc., and to further be proactive in steering (indeed, “channeling” and “forcing”) users into specific slots of exposure, attraction, and ultimately, consumption.

What we have in the fundamental OASIS model and its future implementations, in software apps and internet services, provides a serious and powerful alternative that is quite different. It offers the capability to learn more accurately about how people are living and feeling, by understanding better and in non-intrusive, non-manipulative ways, how they feel, think, act, with very central attention to fundamentals of health and basic well-being – physical environments, energy, nutrition, all the basics of life. In this process of active population engagement and motivation, we provide people with resources that include services that may be difficult to find for many people (e.g., where and how to obtain “x” where “x” may be a diagnostic test, or a vaccination, or a supply of some harder-to-find commodities). The internal intelligence of this open-ended system (which may be more aptly termed, “synthetic intelligence” rather than “AI” or “artificial intelligence”), is something that literally grows and develops in the course of its use by the population of individual users and the population of professionals providing a variety of services to those users.

II. Early Summary (23.Feb.2021)

Briefly, we look at the crises past, present and future with regard to serving "critical infrastructure" for multi-function, multi-service communications and special needs, for large and very diverse populations, with a focus on public health, but also incorporating other aspects which can be summarized as safety/security and "essential resources" (e.g., energy, food, water distribution), especially in times of crisis.

But in all of this, a big factor that makes some crisis either less of a problem, or a huge and overwhelming and even injurious/fatal problem, is in getting the right information to the right people. Accurate and timely information, and also avoidance of false, fake, misleading, incomplete and "pseudo" data.

Everything we have seen, worldwide, with COVID, for the past year, is a perfect illustration of the problems. But also it is not only about infectious diseases that become epidemics or pandemics. (For instance, the recent disaster with basic energy (electricity services) in most of the state of Texas, due to storms and cold weather for which they were not at all adequately prepared.)

So, that is how and why we have focused upon development of things like what are Very Briefly (and no updating, publicly, for some time - just too-o-o busy) described as:
Eyrie (public health and epidemiological informatics network, based upon something simple and well-known, Open Streets, and also some other software like Evergreen (originally for public libraries).
And MedAtrium and Bioprot functions, as well.

But now, I see how we should and can bring in the "world" of IoT and different (easy-to-use, inexpensive, compact, and "consumer-friendly") devices for monitoring basic health, fitness, and a large variety of biomedical and psychological states (e.g., blood pressure, pulse, oxygen metabolism, and other vital indicators).

All of that information - even sporadic, even "scattered" over time and space - goes into a reasonably simple group of algorithms that tells a lot of useful information regarding both individuals and groups (population sets). This is the "sensor fusion" dimension.

Additionally, there is the "actuator" side of things. Small devices (like "Doppel" for instance (made in the UK by people I know), and more sophisticated bioelectromagnetic stimulators, which are increasingly recognized now as beneficial for a variety of biomedical conditions.
These span a significant range, and can be most broadly termed, "neurophysiological enhancement". (We are not talking here about anything that delivers specific pharmaceuticals, although those exist, too.)

Thus, there is information coming from those "actuator" devices, including basic data about who uses what, when, how long, etc.

The cumulative result is this:
Through the IoT network of communications, we will be able to amass a large and diverse set of data that can be interpreted in terms of how people are feeling, in their physical and mental health, both

"objectively" and "subjectively".

This information is valuable for then assisting people with relevant and timely information, ranging from "A to Z" (diet, nutrition, medications, vaccines, what to do and what not to do, etc.).

It is also extremely valuable to the social (community, state) organizations and to private-sector companies that want to serve these people, whether it is about proper public health education, social distancing, vaccines, treatments, or about some products.

III. Some technical background reference notes and images (25.Feb.2021)

There are some architectural and software components (both basic algorithms and code) that comes, in terms of MJD and IRI/TI work, from prior projects, most of which span 2015-2019.

These are all in other components – modules and also system architecture documents.

I think that some of these will be applicable and useful to different aspects of what this new and broader, redirected project can become. As far as actual software, the code, maybe not so, because there is so much rapid change and new development, so much turnover, so many new things that can be used and especially from the open-source world. I am not referring here to interactive web apps or middle-ware for DBMS or back-end AI modules, so much as I am thinking about servo-controllers for sensors, actuators, other devices that can be the sources of data being acquired, such as from wearable units, or the receiving destinations for control data (e.g., actuators that deliver electromagnetic signals such as stimulation pulses, photobiomodulation, ultrasonics, and even (down the road) drug administration).

Here I will briefly list some architectural terms, all of which are coming from the earlier work, which was primarily in three broad areas:

- knowledge-based systems for identification of patterns in the activity of massively large populations of users in social networks in order to creative valid predictions and forecasts of user interests, dispositions, and decision-trends; thus, our SELDON system work, a "Prediction Engine", intended to be comparable to what a "search engine" does when one looking for some data in a massive resources (e.g., the whole web))

- intelligent sensor, actuator and robot control for agricultural and environmental (including energy) applications, focused upon "harsh" network environments in that the main target-space was the world of rural communities in lower-technology and economically-disadvantaged countries; thus, our IntelAgros system (also referred to in the past as AgriBrains and S-Water) and the more encompassing EcoVita system architecture in which IntelAgros is embedded and in which it grows. [See the figures on the following pages here.]

- Intelligent sensor and actuator control, particularly for groups of robots operating in remote and challenging environments, particularly in mid-range Earth orbits and further in deep space; thus, our ASTRIC work, which achieved a reasonably high level of development but has been curtailed by lack of sufficient funding support for the next phases. [See an overview paper, separate document.]

I will provide those other materials in a manner than should be understandable, especially when people can be present together to have direct dialog!

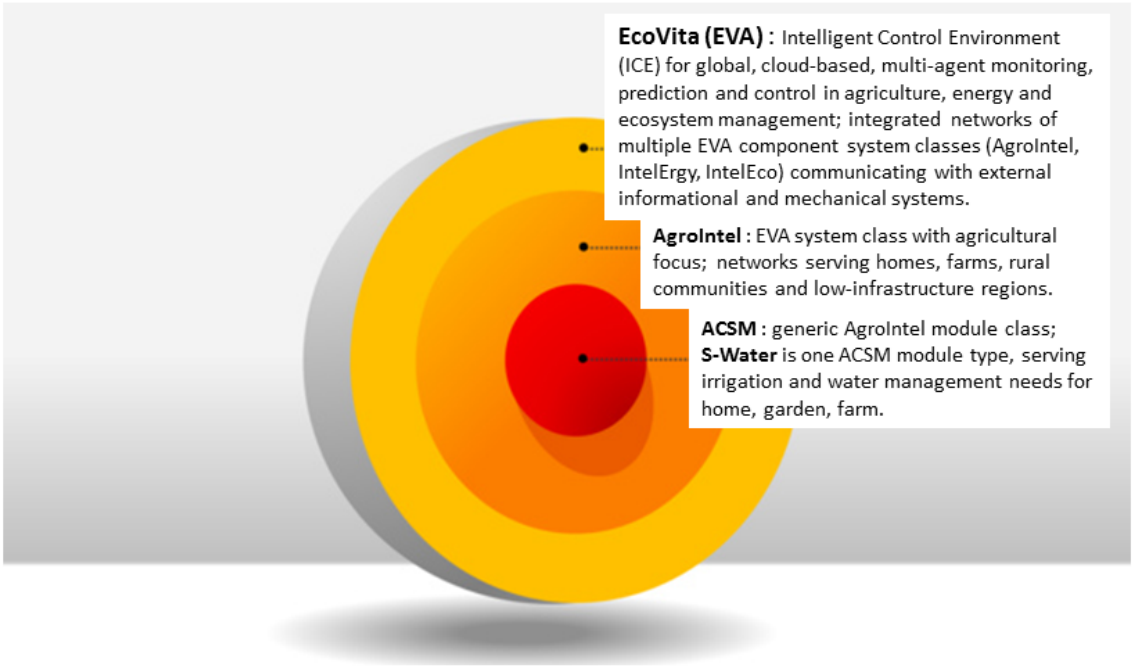
At the moment, I believe that there is a lot from the IntelAgros work that can go directly into CHS development, but also, IntelAgros itself could and perhaps should be "reactivated" and finished as a real Product. There are EU companies, too, including fairly large ones, that had supported this in the past and they could be reapproached, especially with regard to applications that serve economic

(re)development in post-COVID times, especially for PT, ES, IT, also FR, and also EU commercial interests in Africa and the Middle East.

Moreover, the ASTRIC development can also feed into both IntelAgros and CHS, and one should not forget that ASTRIC is very much needed for the future safety and integrity of not only some region or population sector but for the entire Planet. This is why I am not abandoning ASTRIC, even though it has been very much in the background during 2020-present, especially.

The images on the following pages mainly refer to prior work on IntelAgros and its underlying system architecture and framework. All of this could be reshaped and redirected into CHS type project(sd), or refocused and re-energized itself for

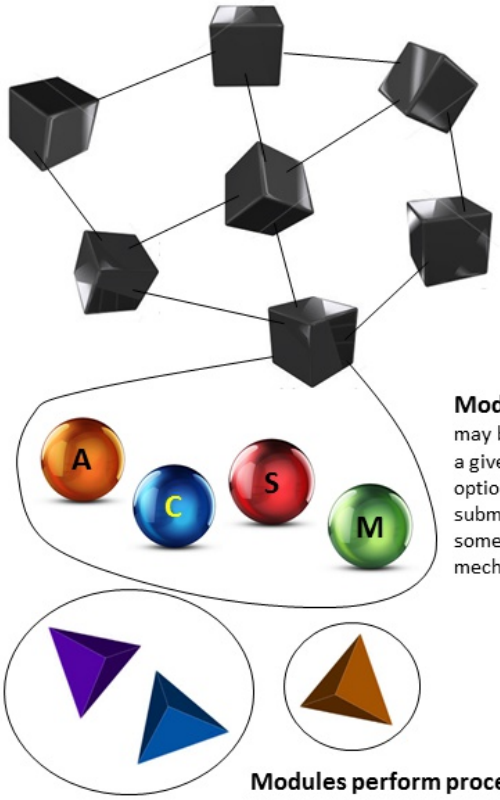
Smart Farming, Energy and Climate Change Adaptation that is also sensitive and practical for aspects of public health and the avoidance, control and abatement of epidemics and pandemics



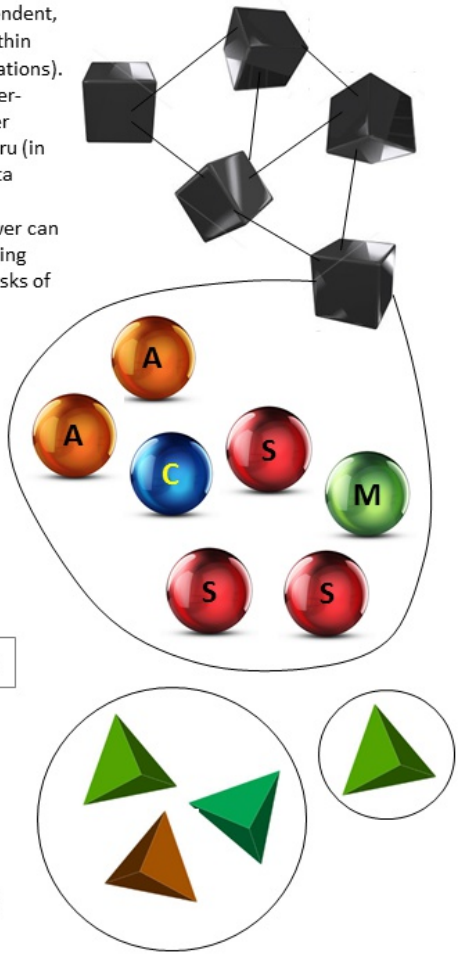
EcoVita (EVA) is a class-based architecture for networks that provide informational and mechanical control functions using modules that contain four functional submodules: Acquisition, Cognition, Servoactivation, Communication. Each module instance has specific tasks, some that are network-shared, reconfigurable and reassignable among other modules.

In addition to its assigned specific class and instance tasks, each module can serve in a MIMD parallel processing network (CHANT, Banyan CSP) providing multi-directional data throughput and segmented-task processing using BOINC-type distributed network computing with load balancing across the local network and potentially the global EVA network.

EVA operates, as a background set of computational tasks, the data mining, analysis, pattern recognition, and learning that constitutes the SELDON Prediction Engine (forecasting environmental, climate-related, energy, agriculture outcomes).



Two AgroIntel Networks : Independent, multiple types of modules in each, within separate installations (e.g., farm operations). All networks together comprise a super-network that (according to user/owner options) can exchange, share, pass-thru (in MANET protocols), many different data streams.
Collectively the digital processing power can work together to share/serve processing needs including parallel distributed tasks of SELDON processing tasks.

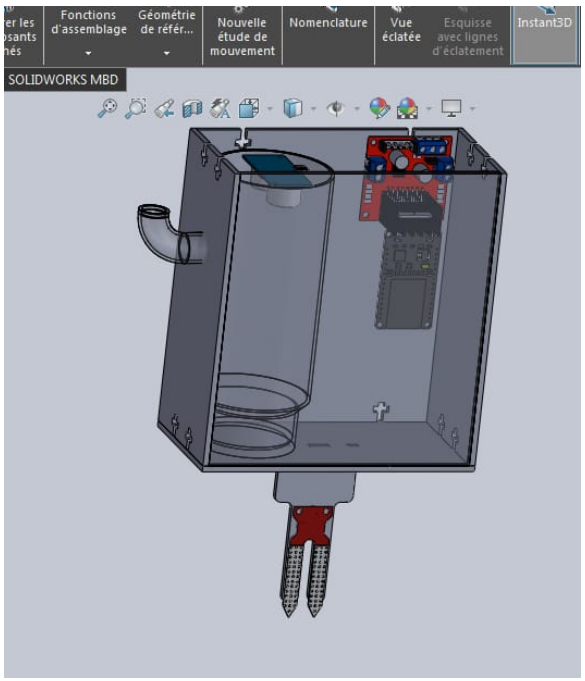


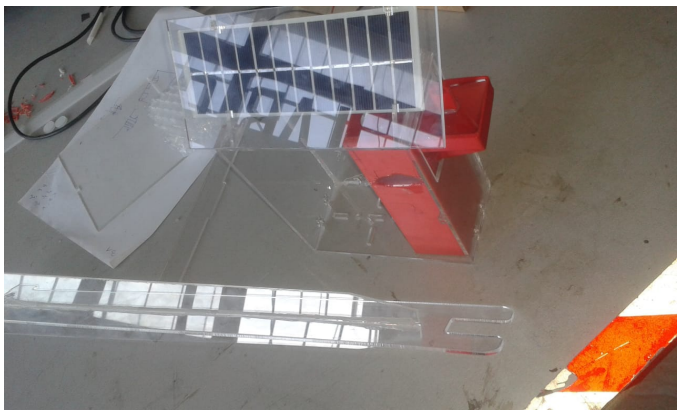
Modules contain submodules : There may be one or multiple submodules within a given module type (either fixed-design or optional and add-on of multiple submodules. Some may be purely software, some may involve electronic devices and mechanical apparatus.

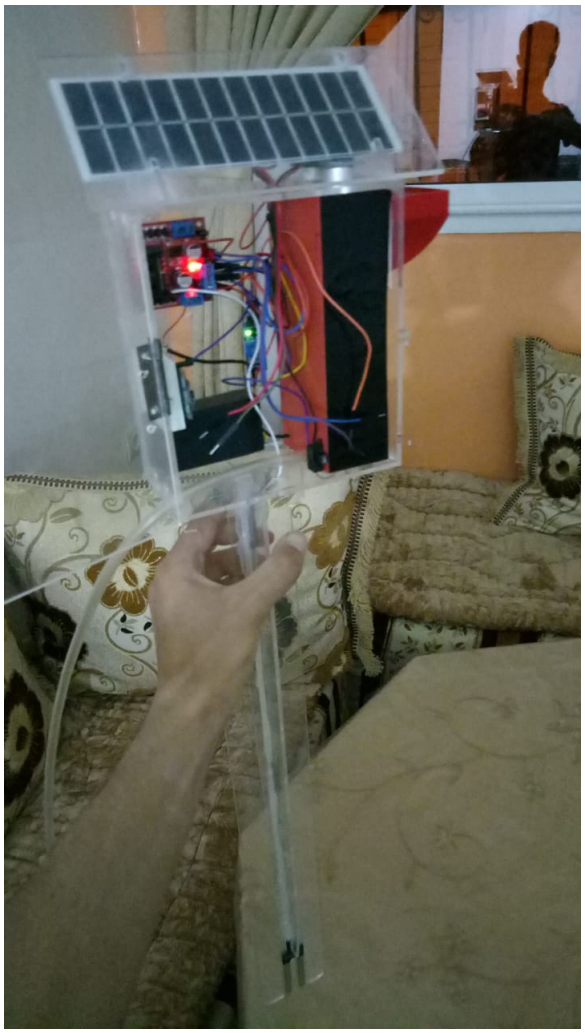
EcoVita (EVA) Module Logic

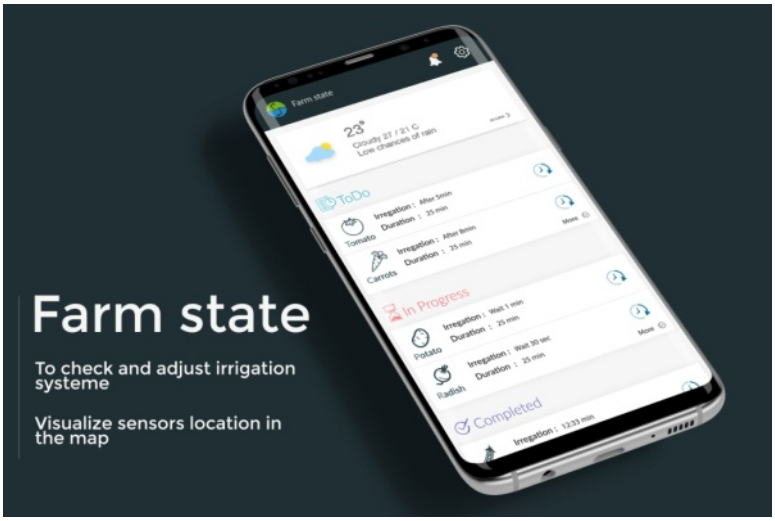
Modules perform processes : A process is implemented by a submodule. There may be multiple submodules within a given module, and each of those may have either a singular process to execute, or multiple processes that are executed sequentially or in parallel. This will be frequently the case where there are multiple types of sensors, servoactuators, or cognitive tasks to be performed within a given module.

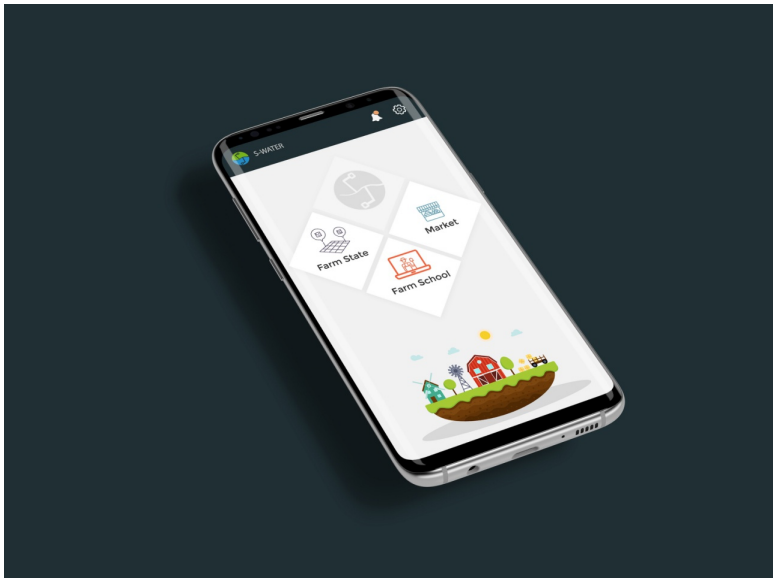
EcoVita
AgroIntel System
S-Water Module
by MIRNOVA

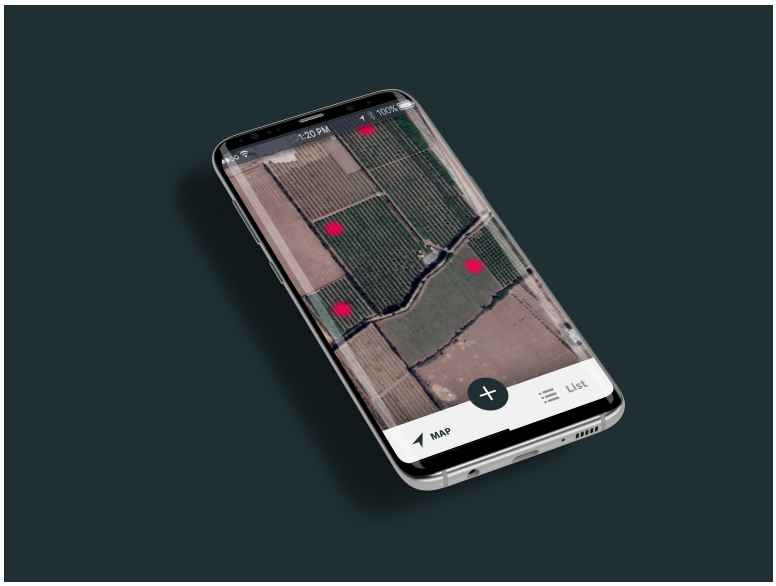

Fonctions d'assemblage
Géométrie de référ...
Nouvelle étude de mouvement
Nomenclature
Vue éclatée
Esquisse avec lignes d'éclatement
Instant3D
SOLIDWORKS MBD






Farm state
To check and adjust irrigation systeme
Visualize sensors location in the map
Farm state
23°
ToDo
In Progress
Completed


S-WATER
Farm State
Market
Farm School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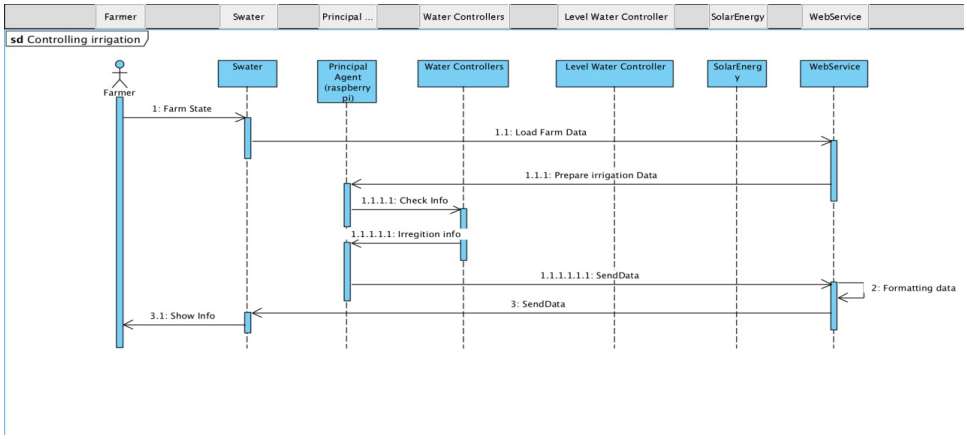
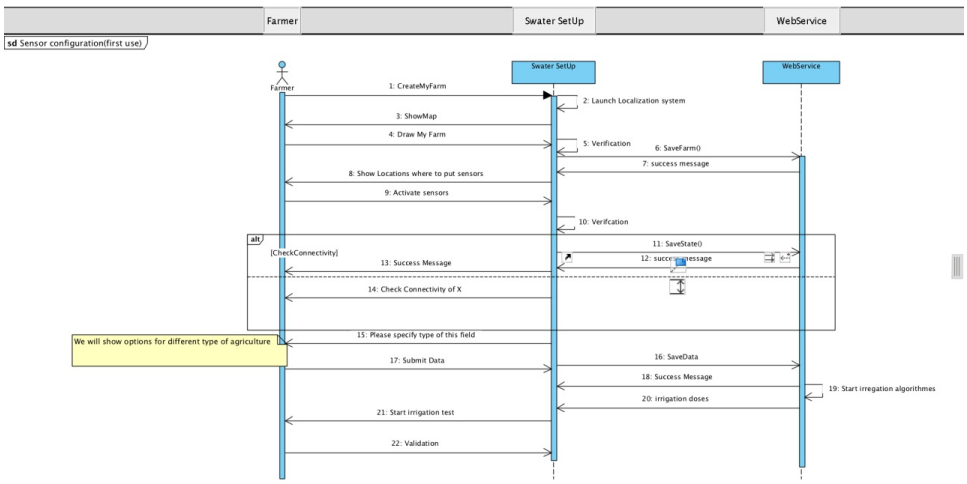
MAP
List

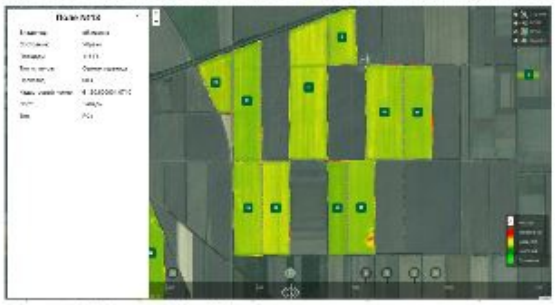




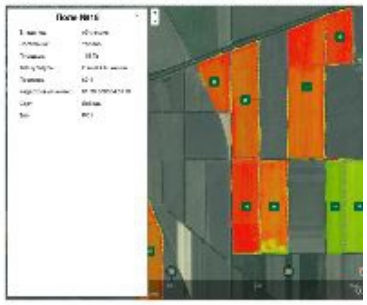
S-WATER

- ✔ Intelligent irrigation system (which take the feature of plant,climate ,ground..to make the right decision)
- ✔ Automatic chemical fertilizers controller
- ✔ Avoid damage caused by volatile climate
- ✔ Take a full control of your farme from one click via mobile application.
- ✔ Give farmers the ability to discouver new market, keep them in touch with what customers really need (This means farmers will not suffer from the small profit margins squeezed by the big supermarkets who have substantial buying power)
- ✔ Our farmers will be able to get help - giving assistance - learn via our dedicated agriculture platform

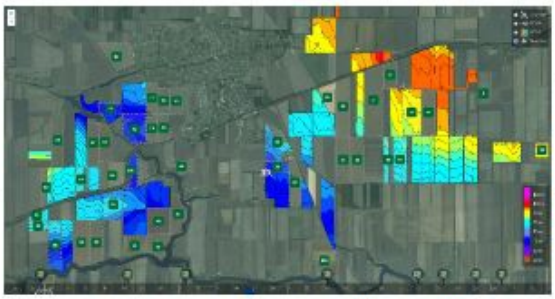
Hyper-spectrum satellites and drones: 70 fields monitoring (www.a



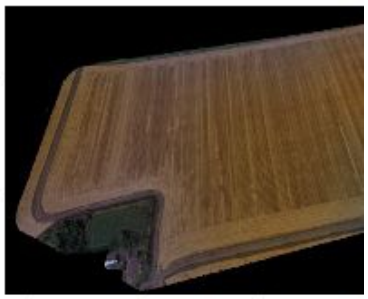
Web-portal interface
with an overlay map and the NDVI data field 18



Changing the values of NDVI (July - S

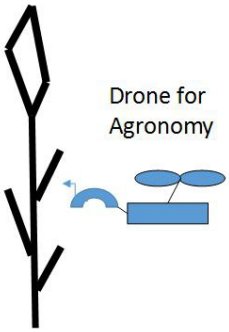


Example of maps with elevation contours on farm fields



Example of 3D-model of the field

Smart Drone for Agronomy: UI for detailed analysis of problematic zones



User interfaces for Agronomist drone for UAV DJI Phantom3

Speed and height settings

Setting points to inspect

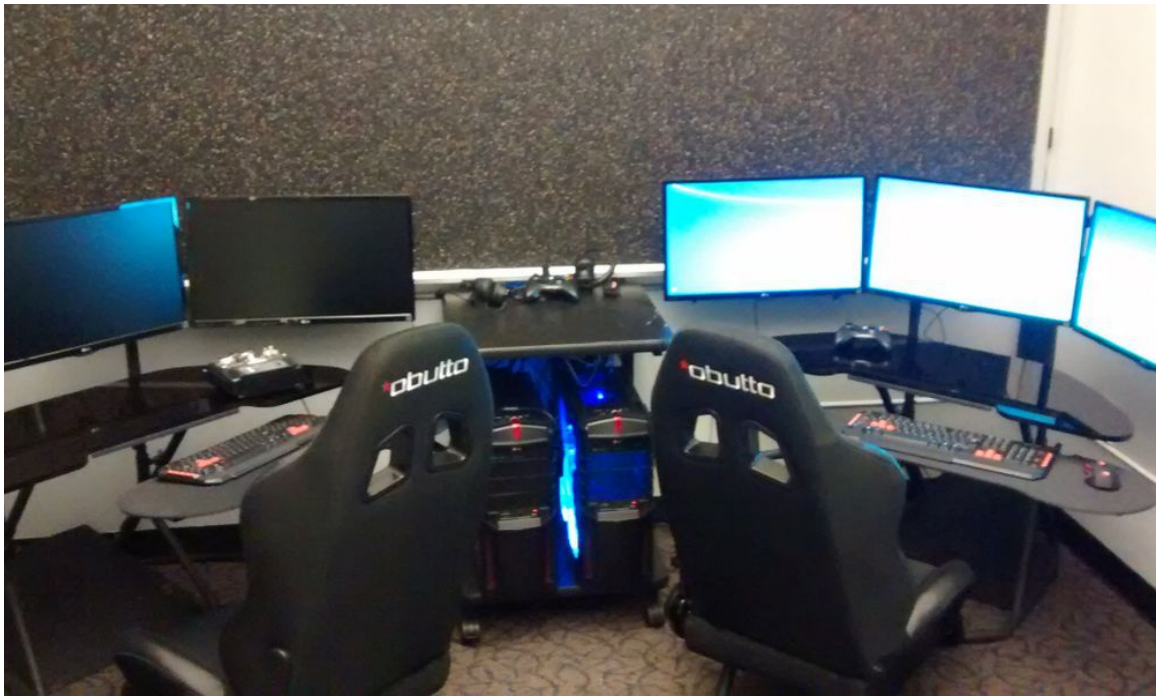
. Mission settings

Our Drone will give user the camera control for interactive inspection of leaves in a middle of the problematic fields

Mission downloading

Tracking the status

Detailed inspection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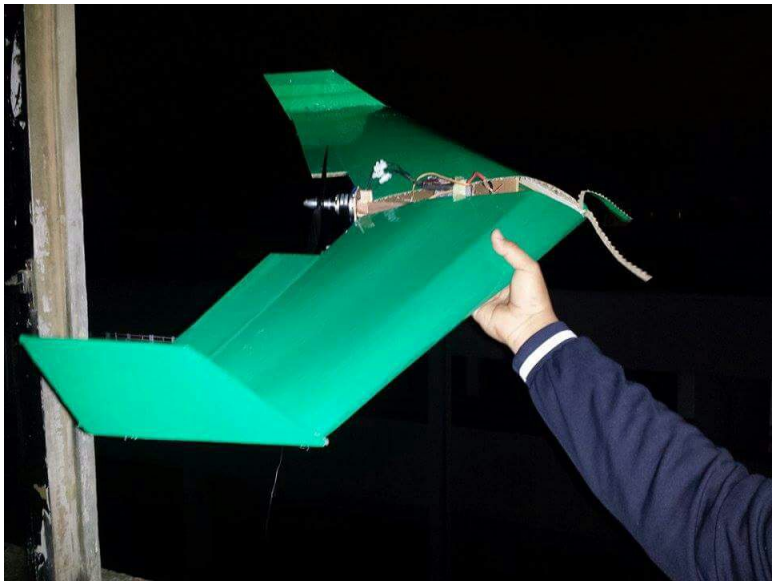

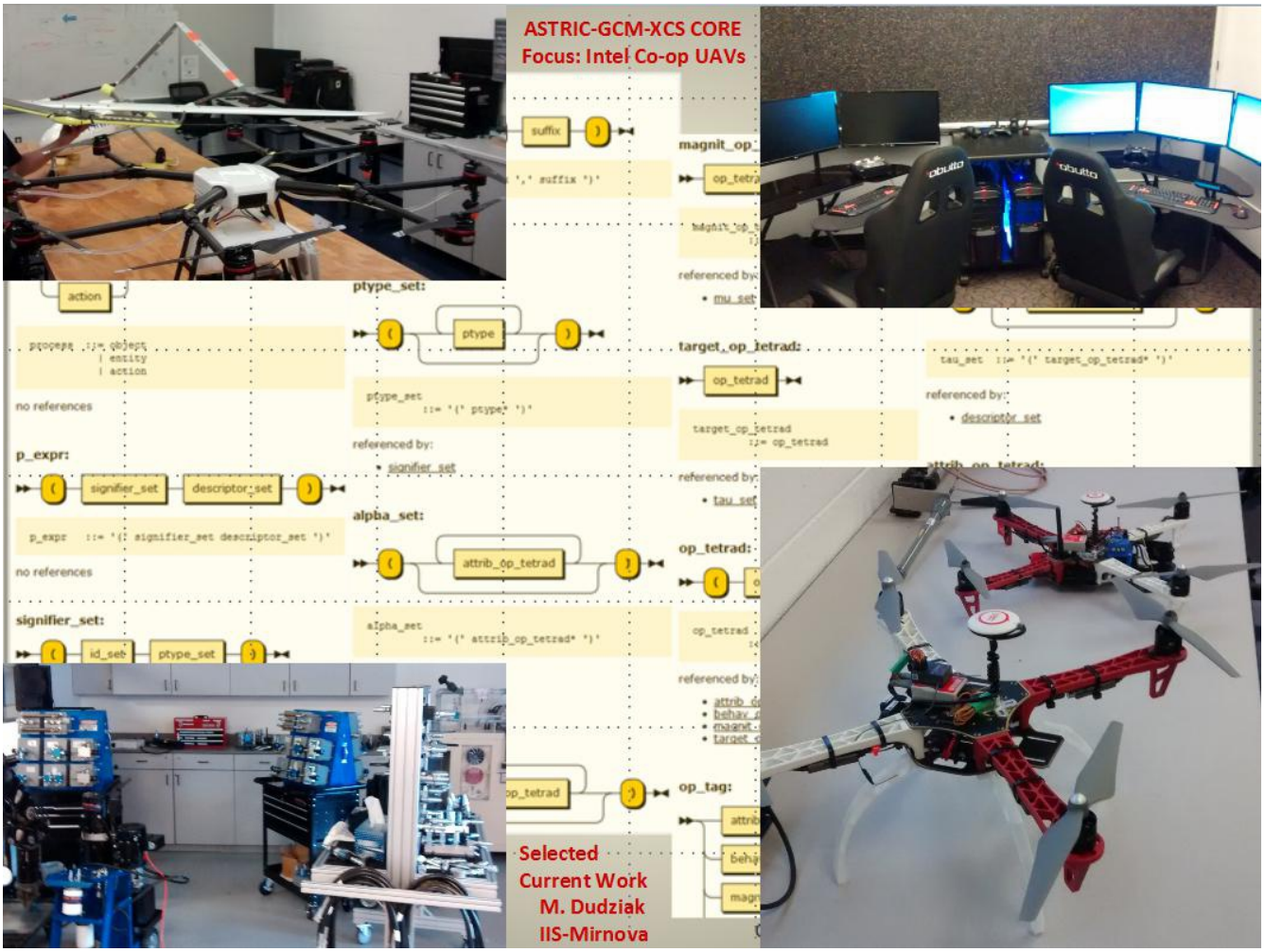
ASTRIC-GCM-XCS CORE
Focus: Intel Co-op UAVs
Selected
Current Work
M. Dudziak
IIS-Mirnova