RUAS
Innovation challenge 2020
Phase-2

Title of the Project: Multiutility Agricultural Robot

Theme   : **Smart Utilities and Devices**

Application No   : **RUASIC/20/56**

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Institute   : **FET, M S Ramaiah University of Applied Sciences**

INTRODUCTION

Agricultural Utility Robot

Agricultural is one of our most important industry for providing food, feed and fuel necessary for our survival. Certainly, robots will play an important role in the field of agriculture for farming process performing them autonomously.

➢ The proposed system focuses on implementing easy farming techniques using *Internet of Things and Deep Learning* techniques at a lower and affordable cost.

➢ The system uses the vision, with custom algorithms being developed to identify plant health, set of sensors and actuators to *monitor atmospheric factors*, an *Intelligent seeding technique* by maintaining proper clearance, GPS guided path following etc.

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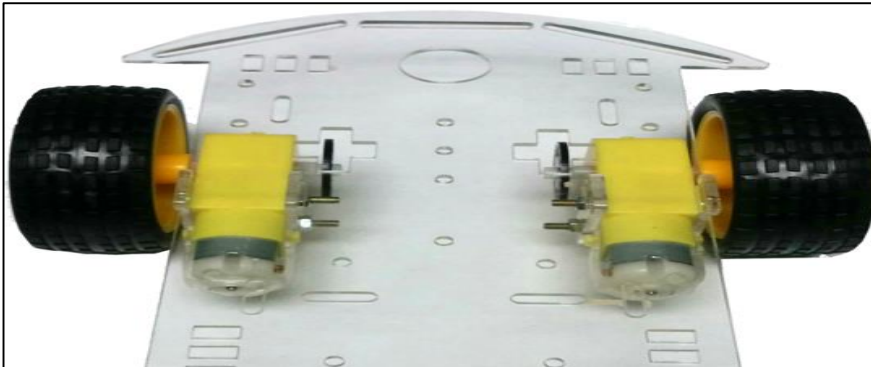
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Essentially the aim of this project is creating the entire system will be integrated into a fully automated package deploying these tasks on field in real-time.

➤ This includes, a farming automation which *indicates the plant health* by observing colour and analyzing their leaves.

➤ The automation will note and host environmental conditions like *Temperature, Humidity, Preassure wetness etc* on ThingSpeak from where data analysis and prediction can be done via MATLAB toolboxes.

➤ The Robot is autonomous and GPS guided. After fixing the waypoints, the robot can move in field independently on a predefined/assigned path. Also, it has a feature to be controlled remotely via Bluetooth.
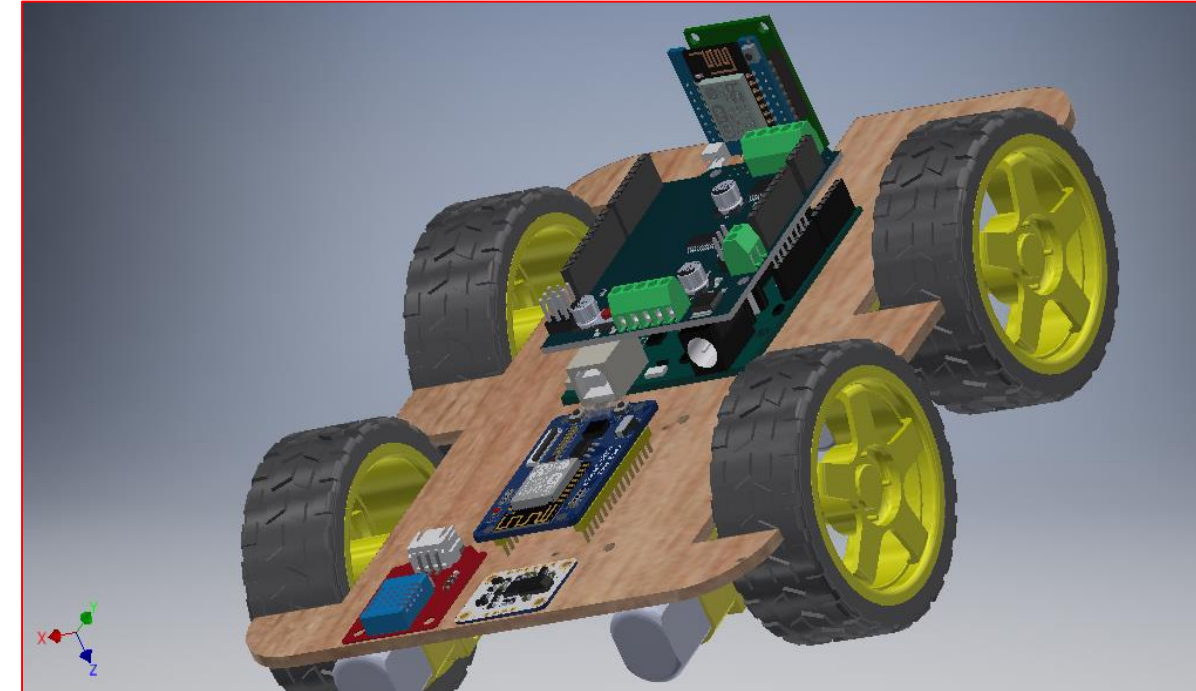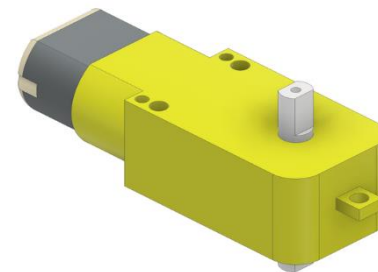
METHOD

- ## DESIGN & DEVELOPMENT

➤ The whole structure stands on a tough metal chassis to which DC motors and wheels are attached.

➤ *Arduino* board and the motor driver shield is fixed to the same which bridges sensors and modules.

figure(i) : CAD model of fabricated vehicle

(ii) Vehicle Chassis

(iii) Driving Motor

(iv) Tough Wheels

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- # FABRICATION

The whole Robot is fabricated in a such a way that it is compatible with rough terrains. All components and modules are attached to a single base chassis. The *CAD Model* of te robot is as shown here:
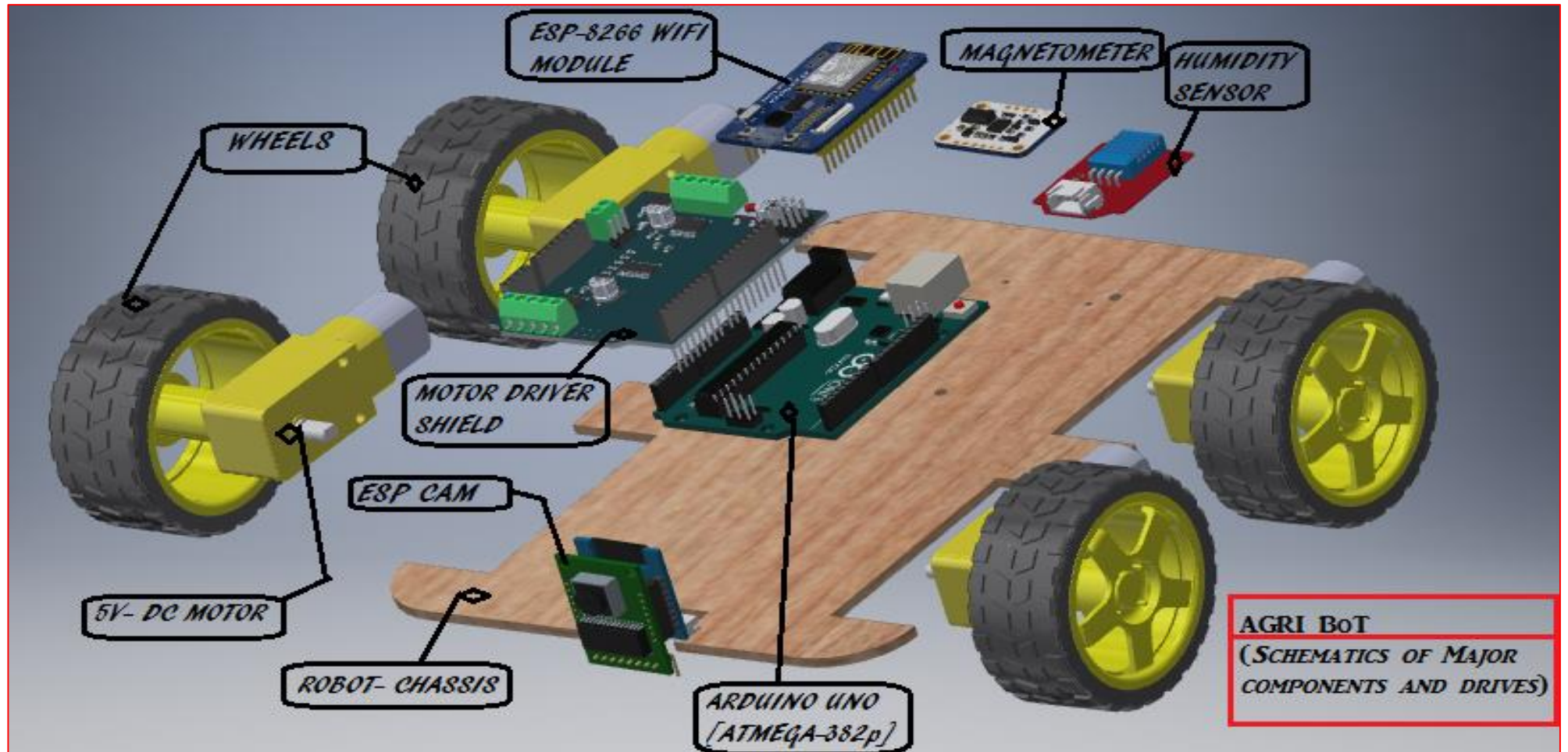

figure (v) : *Autodesk Inventor* model of AGRI_BoT exploded view

- ## EXPERIMENTATION

     The AGRI_BoT model is experimented and tests were made as per real – world applications and it poses excellent results. The following are few images of the Bot and is in development process.
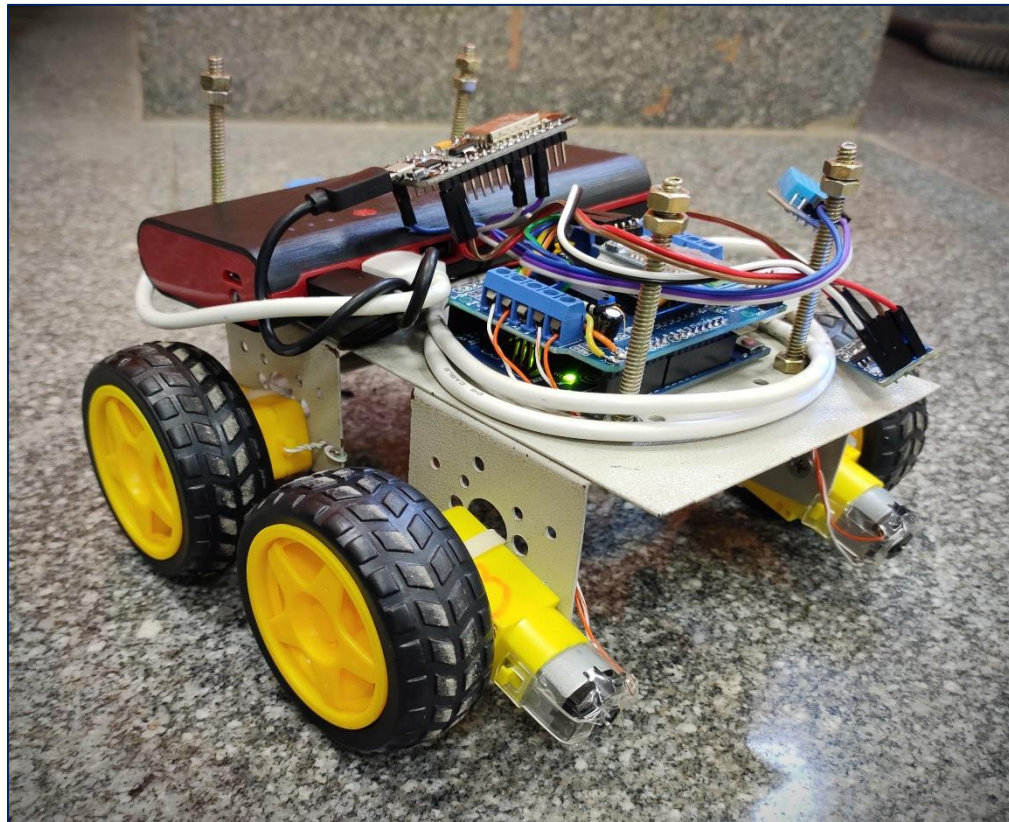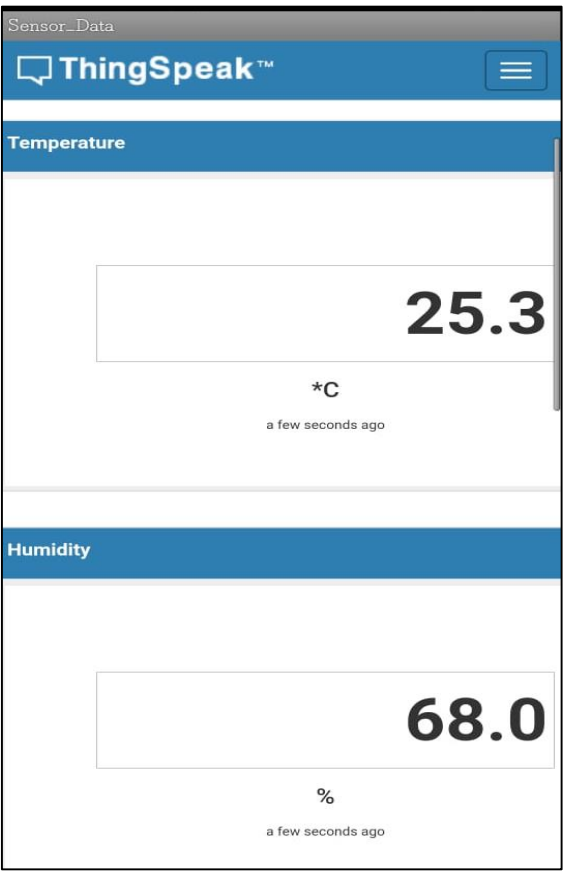

figure (vi) & (vii) : Partially developed model.

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To to control the Robot, we have developed an Android application with *MIT App Inventor.* This app allows smooth user interphase and avails various features integrating with AGRI_BoT

(viii) Control Inerface in App
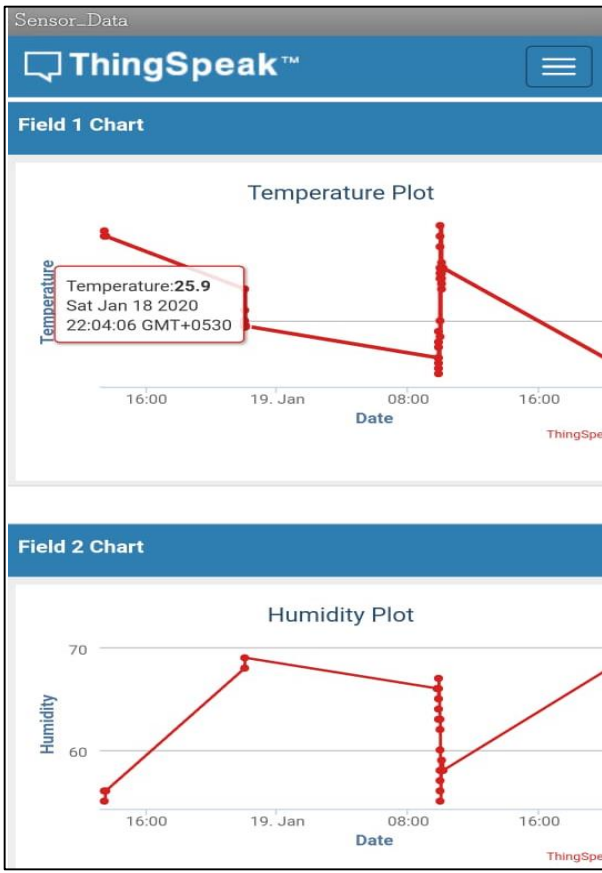
(ix) Field Data Monitring on ThingSpeak (Plots ad Values)

(x) About Bot on UI

- # DEMONSTRATION

    This *Multiutility Agri-Bot* is an advanced Bot equipped with *IoT and Deep Learning techniques*. Its major tasks include :

➤ Acquiring data from the agricultural field (Humidity, Moisture, Light Intensity, Temperature etc) and posting it to *ThinkSpeak server* which displays the same on webpage with graphical plots and analysis from where *MATLAB processing* is done and required deployments are carried out accordingly in real time.

➤ It also has an onboard *ESP CAM* which captures photos & then *analyzes, monitors plant health* time to time. For crops such as Spinach, Corn etc, insect attacks can also be detected to carry out necessary measures against it. Along with this,

➤ The major feature is that it uses a GPS guided waypoint navigation technique. Also, we have developed an application to control it manually.

APPLICATION & POTENTIAL OF COMMERCIALIZATION

➢ During the course of this project we made an attempt to scale down human labour by creating an automation which is able to indicate plant health and other factors which has highly demanding application in the current agricultural system.

➢ This developed system shows high chances and potential of commercialization by outwitting traditional, time consuming, outdated methods which are no more suitable in current trend and are still being used in agricultural processes.

➢ Since it is a low cost, reliable, effecient system, it will pose wide range of demand and necessity in market and real world applications compared to wide range of other agricultural automation systems.

➢ The future plans regarding this project includes creation of common discussion forum on the app developed to create a community forum for discussion within farmers and also introduce direct contact to the markets/sellers for selling of their yields right from there without intervention of mediators/dealers which will increase profits for the farmers.

BUDGET

SL.NO	PARTS	PRICE (INR)	COMPONENTS
1.	Electronic Drivers and Shields	800	Wi-Fi Module, Motor Driver, Bluetooth Module, Solder boards.
2.	Sensors and Actuators	750	Humidity sensor, Preassure Sensor, Magnetometer, GPS module
3.	Fabrication & Mobility	500	Chassis, Wheels, Motors etc.
4.	Microcontroller	550	Arduino UNO, Arduino NANO.
5.	Accesories	1200	ESP CAM, Connnectors, Battery.
6.	Miscallaneous	400	
	TOTAL :	4200	INCLUDING ALL COMPONENTS

FINDINGS & CONCLUSIONS

By the deployment of this project, we have found several real - world applications, improvements an pros :

i) It increases the productivity and reduces labour cost in agriculture and thereby the process is optimized.

ii) The intelligent systems in the Bot provides low cost, effective system which precisely monitors the field factors and automated usage of water, Indcations in right time ensures careful use of water and minimizes loss of resources.

iii) By encaptulating all necessary functions in a well planed and effecient way, this system proves its innovation and achieves by having all modern scalable techniques involved.

So, totally the advent of autonomous system architectures gives birth to complete new range of agricultural Robot and equipment based on small smart machines that can do the right thing, in the right place, at the right time in the right way.