

Agriculture Based Autonomous Vehicle Using Wireless Communication System

¹M. Kavithra, S. Shalini, A. Dhanusha, T. Vanikamatchi, ²S. Suresh

¹UG Scholar Department of Electrical and Electronics Engineering,
Gnanamani college of technology, Namakkal

²Assistant Professor, Department of Electrical and Electronics Engineering,
Gnanamani College of Technology, Namakkal

Abstract - The primary aim of our project is to develop a multitasking agricultural robot, which can be used for agricultural processes like digging the soil, seed sowing, crop cutting (harvesting) and irrigation system. Keeping in mind low cost and more efficient. This robot will derive its power from solar panel making it energy efficient and eco-friendly.

A Multitasking robot for the field of Agriculture has been studied in this research. Now a day, precision agriculture by agricultural robots is the newly emerging technology in agriculture sector. To save the time and energy that is wasted in repetitive farming tasks automation in farming processes is quite helpful. To design these sorts of robots there should be certain considerations and particular approach considering the agriculture environment in which it will be working. The working of an autonomous robot is based on field parameters i.e. length and width. Prototype of an agricultural robot "AgRo-Bot" is modeled for multitasking such as seeding, ploughing and harvesting with a separate irrigation system. It will also help in decreasing the use of non-renewable sources of energy and will not pollute the environment. Other accessories are slaves performing specific operations. The approach is now to develop smarter machines that are intelligent enough to work in an unmodified or semi natural environment.

I. INTRODUCTION

A competitive agriculture sector requires not only more productive farms and agricultural processors, but also a more efficient agriculture distribution system. This is especially the case for the Philippines being an archipelago of thousands of islands, of which only a few are large enough to have the scale of farming that allow economies of scale in processing. Thus, in comparison to Vietnam or Thailand or Peninsula Malaysia, the Philippine agricultural economy is far more fragmented and vulnerable to the inefficiencies and vagaries of the country's distribution system. There is a familiar lament about the state of the Philippine agricultural distribution system; that is, it is cheaper to bring corn from Bangkok to Manila than to bring corn from Cotabato to Manila. This familiar lament exemplifies a fragmented agricultural economy.

In India, near about 70% people are dependent upon agriculture. As compared to other fields globalization in agriculture system is less. So, it is necessary to make some advancement in this field. The idea of robotic agriculture (agricultural environments maintained by good machines) isn't a replacement one. Several engineers have developed driverless tractors within the past however they need not be flourishing as they didn't have the flexibility to hold the complexness. The main motive for developing

Agricultural automation technology is the decreasing labour force, a phenomenon common in the developed world. The reasons are the need for improved food quality. Now a day agricultural operation is automated and also there is commercial availability of automatic machineries and robots. For designing a robot one has to consider two considerations which are precision requirement in the task and environmental conditions in which robot needs to work for automating the agricultural operation. To carry out the process of seeding, robot should move in straightway and also be able to modify the distance between seed dropping. Moisture content in soil can affect the digging process; to complete the process sensors should be chosen according to the environmental conditions of working.

This AgRo-bot is a multifunction Robot that performs three major functions normally required in Agriculture field i.e. Ploughing, Seed distribution and Agriculture Harvesting. This AgRo-bot consist of a switch to select field measurement in length and breadth in Ft and select the mode of operation and after selecting the size of field, a function key allows you to select mode like Ploughing, Seed distribution or Harvester. A start button will activate the DC geared motors to run the AgRo-bot to perform desired function. These things are interfaced with Arduino Atmega328p and programming for the operation of the mode and motor is done on Arduino (IDE) software in c language.

The macroeconomic implications of high food prices cannot be underestimated. Indeed, it can be argued that one key reason for the comparatively lackluster performance of the Philippine manufacturing sector during the 1990's was the comparatively higher wages in the country than in competitor countries like Indonesia and China. The higher domestic wages coincided with the significant rise in agriculture protection, and the consequent higher food costs, in the country during the latter 1980's and the 1990's. Aggravating the cost-push effect of the higher food prices on the manufacturing sector were the decline in industrial protection and the appreciation of the Philippine peso. As a result, many manufacturing plants folded up and it has been mainly in the semi-skilled, less wage-sensitive industries like electrical machinery and automobile parts where the Philippine manufacturing sector registered robust growth.

BLOCK DIAGRAM

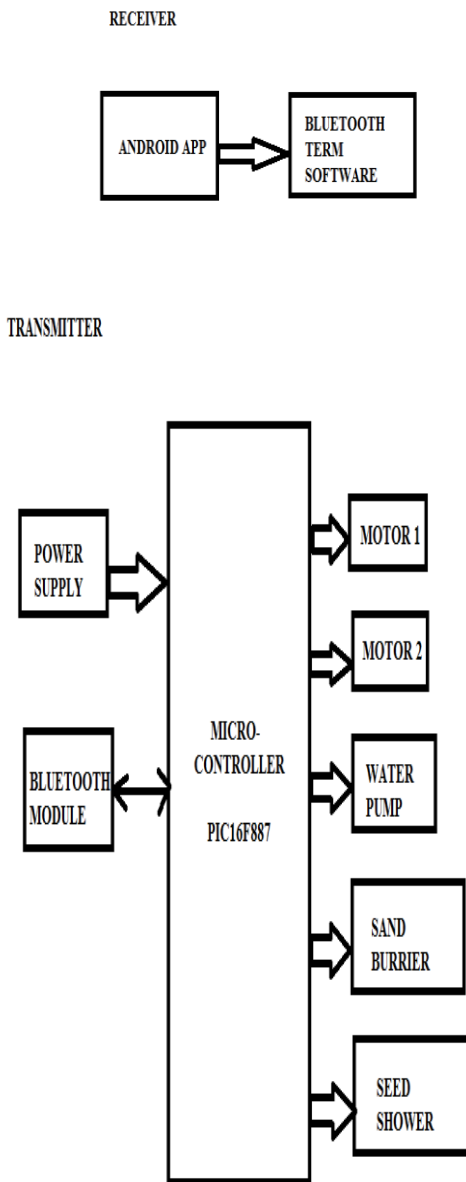


Fig: Transmitter diagram

II.PROPOSED SYSTEM

After studying the existing model on agriculture techniques and robots we listed many disadvantages that we are overcoming with our proposed idea which is AgRo-Bot programmed on single microcontroller PIC16F887 with multiple functions. This AgRo-bot is a multifunction Robot that perform three major functions normally required in Agriculture field i.e. Ploughing, Seed distribution or fertilizer spreader and Agriculture paddy Harvester. This AgRo-bot consist of a control panel to select field measurement in length and breadth in ft. After selecting the size of field, a function key allows you select mode like Ploughing, Seed distribution or Harvester.

III.WORKING

The primary aim of our project is to develop a multitasking agricultural robot, which can be used for agricultural processes like digging the soil, seed sowing, and water spraying for the irrigation system.

This project explains the agriculture techniques and robots we listed many disadvantages that we are overcoming with our proposed idea which is AgRo-Bot programmed on single chip with multiple functions. The block diagram of proposed system consists of a vehicle controlled by PIC16F887 microcontroller as master controller, humidity sensor for irrigation, indicators such as LCD etc. and other accessories. The proposed system integrates all the functions such as plugging, seeding, and watering into a single robot and performs the operations automatically. The whole arrangement with arm is used for plugging, seeding watering whenever required. Agro-Bot will automatically move in field provided length and width of field. It gives us the option to choose the mode of its operation. It will be convenient for farmers to operate in their desired mode. Like moving front, back, left and right in which command we provide through the Bluetooth module. Agro-Bot will also be equipped with solar panels which will help in recharging the batteries by natural source of energy. It will also help in decreasing the use of non-renewable sources of energy and will not pollute the environment.

IV. SAND BURRIER

A plough (UK) or plow (US; both /plan/) is a tool or farm implement used in farming for initial cultivation of soil in preparation for sowing seed or planting to loosen or turn the soil. Ploughs were traditionally drawn by working animals such as horses or cattle, but in modern times are drawn by tractors. A plough may be made of wood, iron, or steel frame with an attached blade or stick used to cut the earth. It has been a basic instrument for most of recorded history, although written references to the plough do not appear in English until c. 1100 at which point it is referenced frequently. The plough represents one of the major agricultural inventions in human history.

The primary purpose of plugging is to turn over the upper layer of the soil, bringing fresh nutrients to the surface, while burying weeds and the remains of previous crops and allowing them to break down. As the plough is drawn through the soil it creates long trenches of fertile soil called furrows. In modern use, a ploughed field is typically left to dry out, and is then harrowed before planting. Plugging and cultivating a soil homogenies and modifies the upper 12 to 25 cm of the soil to form a plough layer. In many soils, the majority of fine plant feeder roots can be found in the topsoil or plough layer.

V.SEED DISTRIBUTION

The dropping of seed is done using the dc motor vibrator mechanical head at the shaft of dc motor. This DC motor is attached mechanism. For that we are using the special with a funnel at the back side of the robot. The point on the farm where we want to dropping the seed is comes, the dc motor has large rpm vibrates so due to his vibration

seeds are dropping from the funnel and a thin Al sheet is fixed below the hole of the funnel to control the quantity and density of the seeds. In this way the controlling action of motor takes place at equal distance of farm, and also it dropped quantities seed's on the farm. A shovel is a tool for digging, lifting, and moving bulk materials, such as soil, coal, gravel, snow, sand, or ore.

VI.SAND SHOVAL

Most shovels are hand tools consisting of a broad blade fixed to a medium-length handle. Shovel blades are usually made of sheet steel or hard plastics and are very strong. Shovel handles are usually made of wood (especially specific varieties such as ash or maple) or glass-reinforced plastic (fiberglass).

Hand shovel blades made of sheet steel usually have a folded seam or hem at the back to make a socket for the handle. This fold also commonly provides extra rigidity to the blade. The handles are usually riveted in place. A T-piece is commonly fitted to the end of the handle to aid grip and control where the shovel is designed for moving soil and heavy materials. These designs can all be easily mass-produced.

VII.BLUETOOTH MODULE

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. The HC-05 Bluetooth Module can be used in a Master or Slave configuration, making it a great solution for wireless communication. This serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Blue core 04-External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature).

The Bluetooth module HC-05 is a MASTER/SLAVE module. By default the factory setting is SLAVE. The Role of the module (Master or Slave) can be configured only by AT COMMANDS. The slave modules cannot initiate a connection to another Bluetooth device, but can accept connections. Master module can initiate a connection to other devices. The user can use it simply for a serial port replacement to establish connection between MCU and GPS, PC to your embedded project, etc.

Remember the models HC-04 or HC-06 are SLAVE only modules .HC-05 is the module of interest in this post. To identify the model you can see the pin count. If the module has 5 or 6 pins it is HC-05.If the module has only 4 pins then it is HC-04 or HC-06.

The firmware for HC04 is LINVOR & for the HC05 it is HC05 itself. If you scan for Bluetooth devices from your Android phone you can see this name. The extra pins in HC-05 are the KEY & STATE pins. The KEY pin is used to enter the Command mode.

VIII.BUTTON SWITCH

This is used to switch the module into AT command mode. To enable AT command mode, press the button switch for a second. With the help of AT commands, the user can change the parameters of this module but only when the module is not paired with any other BT device. If the module is connected to any other Bluetooth device, it starts to communicate with that device and fails to work in AT command mode. we know that Vcc and Gnd of the module goes to Vcc and Gnd of Arduino.The TXD pin goes to RXD pin of Adriano and RXD pin goes to TXD pin of Adriano i.e.(digital pin 0 and 1).The user can use the on board Led. But here, Led is connected to digital pin 12 externally for betterment of the process.

IX.CONCLUSION

This automated robotic machine which is named as "Agro-Bot" is specially designed to facilitate the farmers so that the demand of food can be met easily. Agriculture robot serves better result than manual system. It is an automated robot which works on the basis of size of field, size of seed and in which mode it is meant to be operated. This robot can be controlled by using algorithm for the comfort of farmers and interfaced by using arduous board. It is expected that this robot will change the trend of farming in the upcoming days from manual to automate. The implementation of Agro-Bot has significant saving in the term of time, efficiency, man power, wastage of resources and also it works at much cheaper price. This also makes farming easy to learn and implement. By the help of this robot we can create the interest of youth in farming which is very important for our development. These robots can be created in different sizes as per the requirement of farm which will make it more affordable. Robots can come over the difficulties in farming and also it leaves scope of further advancement in it.

REFERENCES

- [1] Griepentrog, H. W., Nørremark, M., Nielsen, H., and Blackmore, B. S., Seed Mapping of Sugar Beet, Precision Agriculture, April 2005, Volume 6, Issue 2,
- [2] Nidhi Agarwal, Ritula Thakur "Agricultural Robot: Intelligent Robot for Farming" International advanced Research Journal in Science, Engineering and Technology, Vol. 3, Issue 8, pp. 177-181, August 2016 pp. 157–165
- [3] Mr.Sagar R. Chavan*, Prof. Rahul D. Shelke, Prof. Shrinivas R. Zanwar, "ENHANCED AGRICULTURE ROBOTIC SYSTEM", International Journal Of Engineering Sciences & Research, 2015, pp.368-371
- [4] [3] Ashish Lalwani, MrunmaiBhide, S. K. Shah "A Review: Autonomous Agribot For Smart Farming" 201546th IRF International Conference, 2015
- [5] Neha S. Naik, Veranda. V. Shete, Shruti. R. Danve. "Precision agriculture robot for seeding function", 2016 International Conference on Inventive Computation Technologies (ICICT), 2016.
- [6] Patrick Piper and Jacob Vogel published a paper on "Designing an Autonomous Soil Monitoring Robot" (IEEE - 2015).
- [7] Gragliapublished a paper on "Autonomous robots for agricultural tasks and farm assignment and future trends in agro robots" (IJMME-IJNS2013).

- [8] Table, Rubens A, Godoy, Eduardo P, Pereira, Robson R. D, Tangerine, Giovanna T, Porto, Arthur J. V, & Inamasu, Ricardo Y. (2011). Design and development of the architecture of an agricultural mobile robot. *Engenharia Agricola*, 31(1), 130-142. Retrieved November 19, 2015, from Jilin Hue, Lei Zhang, Tony E. Grift. (2012). Variable field-of-view machine vision based row
- [9] guidance of an agricultural robot. *Computers and Electronics in Agriculture*, Volume 84, February 2012, Pages 85-91
- [10] Ali, A. Nazar. "Cascaded Multilevel Inverters for Reduce Harmonic Distortions in Solar PV Applications." *Asian Journal of Research in Social Sciences and Humanities* 6.Issue : 11 (2016): 703-715.
- [11] Ali, A. Nazar. "A Single phase Five level Inverter for Grid Connected Photovoltaic System by employing PID Controller." *African journal of Research* 6.1 (2011): 306-315.
- [12] ali, A.Nazar. "A SINGLE PHASE HIGH EFFICIENT TRANSFORMERLESS INVERTER FOR PV GRID CONNECTED POWER SYSTEM USING ISPWM TECHNIQUE." *International Journal of Applied Engineering Research* 10.ISSN 0973-4562 (2015): 7489-7496.
- [13] Ali, A. Nazar. "Performance Enhancement of Hybrid Wind/Photo Voltaic System Using Z Source Inverter with Cuk-sepic Fused Converter." *Research Journal of Applied Sciences, Engineering and Technology* 7.ISSN: 2040-7459; (2014): 3964-3970.
- [14] Ali, A. Nazar. "Ride through Strategy for a Three-Level Dual Z-Source Inverter Using TRIAC." *Scientific Research publication* 7.ISSN Online: 2153-1293 (2016): 3911-3921.
- [15] Ali, A. Nazar. "An ANFIS Based Advanced MPPT Control of a Wind-Solar Hybrid Power Generation System." *International Review on Modelling and Simulations* 7.ISSN 1974-9821 (2014): 638-643.
- [16] Nazar Ali, A. "Performance Analysis of Switched Capacitor Multilevel DC/AC Inverter using Solar PV Cells." *International Journal for Modern Trends in Science and Technology* 3.05 (2017): 104-109.
- [17] Ali, A.Nazar. "FPGA UTILISATION FOR HIGH LEVELPOWER CONSUMPTION DRIVES BASEDONTHREE PHASE SINUSOIDAL PWM -VVVF CONTROLLER." *International Journal of Communications and Engineering* 4.Issue: 02 (2012): 25-30.
- [18] ali, A.Nazar. "A SINGLE PHASE HIGH EFFICIENT TRANSFORMERLESS INVERTER FOR PV GRID CONNECTED POWER SYSTEM USING ISPWM TECHNIQUE." *International Journal of Applied Engineering Research* 10.ISSN 0973-4562 (2015): 7489-7496.
- [19] JAIGANESH, R. "Smart Grid System for Water Pumping and Domestic Application using Arduino Controller." *International Journal of Engineering Research & Technology (IJERT)* 5.13 (2017): 583-588.
- [20] Pau1l, M. Mano Raja, R. Mahalakshmi, M. Karuppasamyandian, A. Bhuvanesh, and R. Jai Ganesh."Classification and Detection of Faults in Grid Connected Photovoltaic System."
- [21] Ganesh, Rajendran Jai, et al. "Fault Identification and Islanding in DC Grid Connected PV System." *Scientific Research Publishing* 7.Circuits and Systems, 7, 2904-2915. (2016): 2904-2915.
- [22] Jaiganesh, R., et al. "Smart Grid System for Water Pumping and Domestic Application Using Arduino Controller." *International Journal for Modern Trends in Science and Technology* 3.05 (2017): 385-390.
- [23] Kalavalli,C., et al. "Single Phase Bidirectional PWM Converter for Microgrid System." *International Journal of Engineering and Technology (IJET)* ISSN : 0975-4024 Vol 5 No 3 Jun-Jul 2013.
- [24] Lilly Renuka, R., et al. "Power Quality Enhancement Using VSI Based STATCOM for SEIG Feeding Non Linear Loads." *International Journal of Engineering and Applied Sciences (IJEAS)* ISSN: 2394-3661, Volume-2, Issue-5, May 2015.
- [25] Karthikeyan,B. JEBASALMA. "RESONANT PWM ZVZCS DC TO DC CONVERTERS FOR RENEWABLE ENERGY APPLICATIONS ." *International Journal of Power Control and Computation(IJPCSC)*Vol 6. No.2 – Jan-March 2014 Pp. 82-89@gopalax Journals, Singaporeavailable at :www.ijcns.comISSN: 0976-268X.
- [26] Gowri,N, et al. "Power Factor Correction Based BridgelessSingle Switch SEPIC Converter Fed BLDC Motor." *ADVANCES in NATURAL and APPLIED SCIENCES*. ISSN: 1995-0772 AENSI PublicationEISSN: 1998-1090 [http://www.aensiweb.com/ANAS2016_March_10\(3\):_pages_190-197](http://www.aensiweb.com/ANAS2016_March_10(3):_pages_190-197).
- [27] Ramkumar,R., et al." A Novel Low Cost Three Arm Ac AutomaticVoltage Regulator" *ADVANCES in NATURAL and APPLIED SCIENCES*ISSN: 1995-0772 AENSI PublicationEISSN: 1998-1090 [http://www.aensiweb.com/ANAS2016_March_10\(3\):_pages_142-151](http://www.aensiweb.com/ANAS2016_March_10(3):_pages_142-151).
- [28] Kodeeswaran, S., T. Ramkumar, and R. Jai Ganesh. "Precise temperature control using reverse seebeck effect." In *Power and Embedded Drive Control (ICPEDC)*, 2017 International Conference on, pp. 398-404. IEEE, 2017.
- [29] Subramanian, AT Sankara, P. Sabarish, and R. Jai Ganesh. "An Improved Voltage follower Canonical Switching Cell Converter with PFC for VSI Fed BLDC Motor." *Journal of Science and Technology (JST)* 2, no. 10 (2017): 01-11.
- [30] Murugesan,S, R. Senthilkumar."DESIGN OF SINGLE PHASE SEVEN LEVEL PV INVERTER USING FPGA." *International Journal of Emerging Technology in Computer Science & Electronics*, 2016, Vol.20, No.2, pp.207-2012.
- [31] S. Murugesan, C. Kalavalli, " FPGA Based Multilevel Inverter With Reduce Number of Switches For Photovoltaic System", *International Journal of Scientific Research in Science, Engineering and Technology(IJSRSET)*, Print ISSN : 2395-1990, Online ISSN : 2394-4099, Volume 3 Issue 6, pp.628-634, September-October 2017.
- [32] Vikram, A. Arun, R. Navaneeth, M. Naresh Kumar, and R. Vinoth. "Solar PV Array Fed BLDC Motor Using Zeta Converter For Water Pumping Applications." *Journal of Science and Technology (JST)* 2, no. 11 (2017): 09-20.
- [33] Nagarajan, L. Star Delta Starter using Soft Switch for Low Power Three Phase Induction Motors. *Australian Journal of Basic and Applied Sciences*, 9(21), 175-178.
- [34] Vinusha, S., & Nagarajan, L. (2015). CURRENT SOURCE INVERTER FED INDUCTION MOTOR DRIVE USING MULTICELL CONVERTER WITH ANFIS CONTROL.
- [35] Nagarajan, L., & Nandhini, S. (2015). AN EFFICIENT SOLAR/WIND/BATTERY HYBRID SYSTEM WITH HIGH POWER CONVERTER USING PSO.
- [36] Subramanian, AT Sankara, P. Sabarish, and R. Jai Ganesh. "An Improved Voltage follower Canonical Switching Cell Converter with PFC for VSI Fed BLDC Motor." *Journal of Science and Technology (JST)* 2.10 (2017): 01-11.
- [37] Compensator, D. S. (2015). AN ADAPTIVE CONTROL AND IMPROVEMENT OF POWER QUALITY IN GRID CONNECTED SYSTEM USING POWER ELECTRONIC CONVERTERS.
- [38] Sabarish, P., Sneha, R., Vijayalakshmi, G., & Nikethan, D. (2017). Performance Analysis of PV-Based Boost Converter using PI Controller with PSO Algorithm. *Journal of Science and Technology (JST)*, 2(10), 17-24.