International Journal of Pure and Applied Mathematics
Volume 119 No. 15 2018, 1901-1906
ISSN: 1314-3395 (on-line version)
url: http://www.acadpubl.eu/hub/
Special Issue

http://www.acadpubl.eu/hub/

SMART AGRICULTURE ROBOT

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ABSTRACT:

Agriculture is an essential thing for survival of the humans and the farmers who do agriculture spend so much of time in ploughing the field and irrigating the field etc. The proposed system is a boon to farmers which combines the robotics with agriculture and capable of moving around the field like a farmer and plough the field and sow the seed in the pre determined row and irrigate the field along the rows autonomously. In addition to this, obstacle detection and clearance are also done. All these operations are controlled via WiFi module.

I.INTRODUCTION

Agriculture is considered to be the basis of life for the human species as it is the main source of food grains and other raw materials. It plays a vital role in the growth of country's economy. It also provides large ample employment opportunities to the people. Growth in agricultural sector is necessary for the development of economic condition of the country. Unfortunately, the traditional methods of farming are still used by many farmers which results in low yielding of crops and fruits. But wherever automation had been implemented and human beings had been replaced by automatic machineries, the yield has been improved. Hence there is need to implement modern science and technology in the agriculture sector for increasing the yield. This paper therefore proposes a system which is useful in monitoring the field data as well as controlling the field operations which provides the flexibility. The paper aims at making agriculture smart using automation and IoT technologies. The proposed system concentrates on performing functions like ploughing, sowing seeds, irrigation, detection of obstacles and obstacle clearance.

II. LITERATURESURVEY

A technological revolution is taking place in the area of machine tools, inspection devices and handling equipment. This new revolution has been triggered off by electronics and sustained by ever-increasing capabilities of computers. This has led to emergence of a new technology called mechatronics symbolizing the synthesis of mechanical as Computer-controlled robots are used in industry for welding, assembling and machining, and to handle various materials. Over the past few years, there has been significant interest in designing smart agricultural systems. The use of smart farming techniques can enhance the crop yield, while simultaneously generating more output from the same amount of input. But still, most of the farmers are unaware of the latest technologies and practices. Due to this the yield of crops are becoming low. Also there are a number of factors that contribute to the low yield of crops such as proper soil preparation, seed rate, seed cultivar, different sowing time, lack of moisture in the fields, water logging and salinity, lack of application of fertilizers, plant protection, adoption of modern technologies, proper marketing and lack of investment. Farmers suffer large financial losses because of usage of incorrect irrigation mechanisms, insect pests and attack of plant diseases, usage of uncalculated amount of pesticides and insecticides, and wrong prediction of weather. For getting higher yield on Crops, monitoring is the vital task for the farmers. Due to the various constraints involved in agriculture, there is an urgent need to develop enhanced and economically realistic strategies in growing of crops. The farm irrigation systems in the previous years used simple timers and switches to control the irrigation mechanism for a predetermined time period irrespective of the weather conditions or moisture content present in the soil. By incorporating various advanced sensing and controlling techniques, the crop yield has increased to some extent while simultaneously the labour costs have decreased. However, the major drawback of these techniques are that they are complex in design to fit in the cultivation land and expensive. Thus there is a need for wireless technologies and automation in agriculturefarming.

III. SYSTEMOVERVIEW

The hardware components and various sensors are interfaced with the microcontroller. The Obstacles in the field are detected using ultrasonic sensor and temperature is measured using temperature sensor. Arduino integrates all the functions like ploughing, sowing of seeds, obstacle detection, obstacle clearance and irrigation. These functions are controlled with the help of WiFimodule.

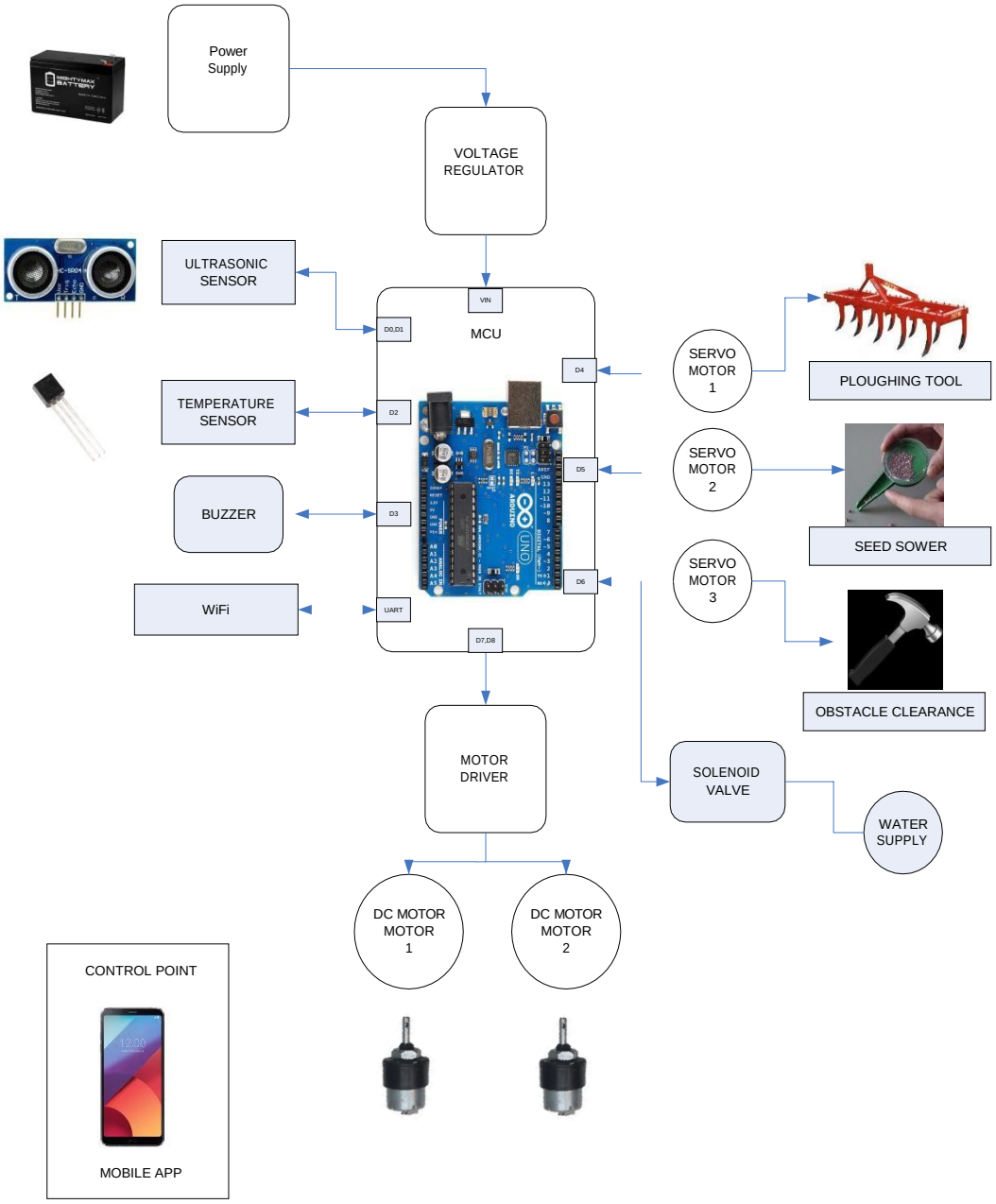

Fig 3.1 Block Diagram of Smart Agriculture

IV. WORKING

The smart agriculture robot can be directed to various directions like forward, reverse, left and right. These directions are commanded by the user by clicking on the respective options on the webpage. On receiving the command, the arduino will send it to the microcontroller. The microcontroller then drives the motor driver circuit to move the robot. In addition to these movements, several functions like ploughing, seed sowing, watering, obstacle detection and obstacle clearance are performed.

A.PLOUGHING

The Ploughing tool is interfaced with the Arduino. The ploughing tool can be operated in three modes namely on, off and mid. The microcontroller will receive the command to work on any of these three modes and it directs the ploughing tool to plough the fieldaccordingly.

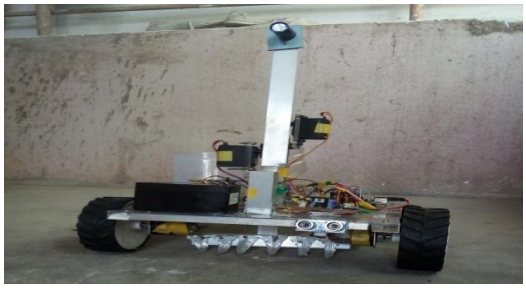

Figure 4.1.Ploughing

B.SEED SOWING

The seeds are stored in a small container and it is closed with a small flip. This flip is controlled by the servomotor to open and close the container. The servomotor is capable of rotating to 180 degrees. Meanwhile, when the servomotor is at 180 degree, it automatically opens the container and hence the seeds are sown in thefield.

Figure 4.2.Seeds in the container

Figure 4.3.Seed sowing

C.WATERING

The temperature sensor interfaced with the Arduino helps to send the information about the temperature to the user via WiFi module.After knowing the temperature,water can be poured on the field.This can be done with the help of relay and solenoid valve.The relay makes the solenoid valve to allow and stop the flow of water to the field.

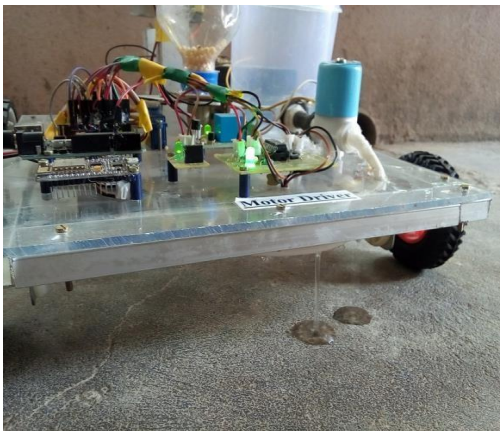

Figure 4.4.Watering

D.OBSTACLE DETECTION AND CLEARANCE

The Ultrasonic sensor is used for the obstacle detection. The obstacles at a distance of 10cm can be detected. After detection, the robot automatically stops. Then the obstacle clearance tool which is connected to the servomotor can be used to break theobstacles.

Figure 4.5.Obstacle detection and obstacle clearance

V. EXPERIMENTATION ANDRESULTS

The sensors and hardware are successfully interfaced with the microcontroller.Test results shows that the various field activities like ploughing,sowing seeds,irrigation,obstacle detection and obstacle clearance are performed and controlled with the help of WiFimodule.

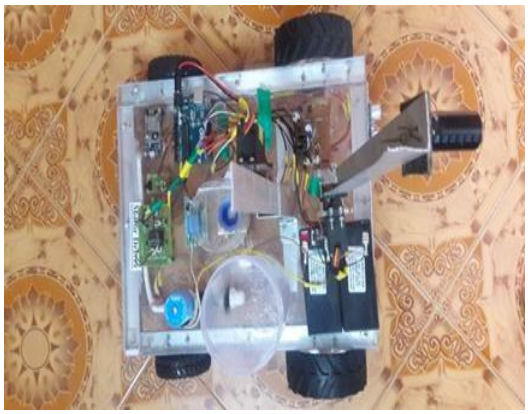

Fig 5.1 Experimental setup

VI. CONCLUSION

For future developments it can be enhanced by developing this system for large acres of land. Also the system can be integrated to check the quality of the soil and the growth of crop in each soil. In addition to this, the weeds can also be detected and removed from the soil. The sensors and microcontroller are successfully interfaced and wireless communication is achieved between various nodes. All observations and experimental tests prove that this project is a complete solution to field activities and irrigation problems. Implementation of such a system in the field can definitely help to improve the yield of the crops and overall production.

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