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Smart Phone Operated Multipurpose Agricultural Robot

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***Abstract*: - The paper aims on the design, development and the fabrication of the robot which can dig the soil, leveler to close the mud and sprayer to spray water, these whole systems of the robot works with the battery and the solar power. More than 40% of the population in the world chooses agriculture as the primary occupation, in recent years the development of the autonomous vehicles in the agriculture has experienced increased interest. The vehicle is controlled by Relay switch through IR sensor input. The language input allows a user to interact with the robot which is familiar to most of the people. The advantages of these robots are hands-free and fast data input operations. In the field of agricultural autonomous vehicle, a concept is been developed to investigate if multiple small autonomous machine could be more efficient than traditional large tractors and human forces.**

I. INTRODUCTION

Agriculture is the backbone of India. The history of Agriculture in India dates back to Indus Valley Civilization Era and even before that in some parts of Southern India. Today, India ranks second worldwide in farm output. The special vehicles plays a major role in various fields such as industrial, medical, military applications etc., The special vehicle field are gradually increasing its productivity in agriculture field. Some of the major problems in the Indian agricultural are rising of input costs, availability of skilled labors, lack of water resources and crop monitoring. To overcome these problems, the automation technologies were used in agriculture. The automation in the agriculture could help farmers to reduce their efforts. The vehicles are being developed for the processes for ploughing, leveling, water spraying. All of these functions have not yet performed using a single vehicle. In this the robots are developed to concentrate in an efficient manner and also it is expected to perform the operations autonomously. The proposed idea implements the vehicle to perform the functions such as ploughing, seed sowing, mud leveling, water spraying. These functions can be integrated into a single vehicle and then performed.

The idea of applying robotics technology in agriculture is very new. In agriculture, the opportunities for robot-enhanced productivity are immense - and the robots are appearing on farms in various guises and in increasing numbers. We can expect the robots performing agricultural operations autonomously such as ploughing, seed sowing, mud closing and water spraying. Watching the farms day & night for an effective report, allowing farmers to reduce the environmental impact, increase precision and efficiency, and manage individual plants in novel ways.

The applications of instrumental robotics are spreading every day to cover further domains, as the opportunity of replacing human operators provides effective solutions with return on investment. This is especially important when the duties, that need be performed, are potentially harmful for the safety or the health of the workers, or when more conservative issues are granted by robotics. Heavy chemicals or drugs dispensers, manure or fertilizers spreaders, etc. are activities more and more concerned by the deployment of unmanned options.

II.METHODOLOGY

The basic aim of this paper is to develop a multipurpose machine, which is used for digging the soil, seed sowing, and leveler to close the mud and water sprayer to spray water with least changes in accessories with minimum cost. This whole system of the robot works with the battery and the solar power. Micros, Spectrum ZX and Commodore 64 machines that people of an earlier generation learned to program on.

- The base frame is made for the robot with 4 wheels connected and driven the rear wheel is dc motor.
- One end of the frame, cultivator is fitted which is also driven by dc motor and design is made to dig the soil.
- water pump sprayer to spray the water.
- Solar is placed on top of the robot and is connected to the battery for charging the battery.
- Thus the max efficiency is utilized from the sun by the solar panel and to the battery.
- The whole robot requires the 12v battery to operate the system.
- IR transmitter and IR receiver is used to control the operation of the vehicle.

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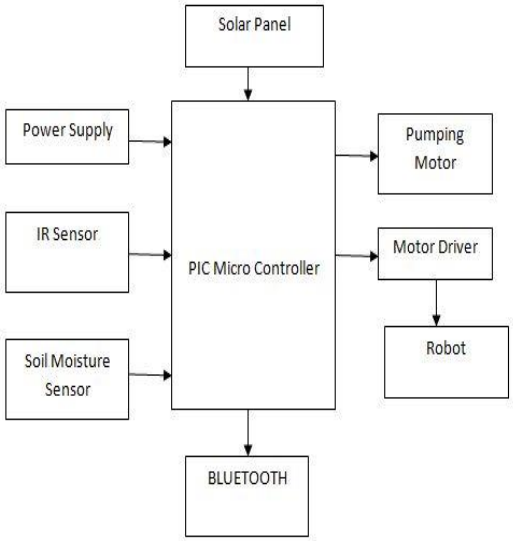

Fig: Block diagram of smart phone multipurpose agricultural robot

The block diagram of multipurpose agriculture robot is shown in the Fig 3.3.it consists of

- PIC Micro Controller
- IR Sensor
- Soil Moisture Sensor
- Bluetooth
- Robot
- Motor Driver
- Pumping Motor

PIC 16F877A Microcontroller is used in this agribot.IR sensor is used to detect the obstacles. Soil moisture sensor is used to detect the moisture content in the soil. Through Bluetooth we can able to get the information about the working of agribot. Motor driver is used to make the robot move on the ground. Pumping motor work is to pump the water to the agricultural field.

III. WORKING PRINCIPLE

The project aims on the design, development and the fabrication of the robot which can dig the soil, leveler to close the mud and turn on and turn off the motor depending on water level in the ground and this whole system of the robot works with the battery and the solar power. The language input allows a user to interact with the robot which is familiar to most of the people. The advantages of these robots are hands-free and fast data input operations. In the field of agricultural autonomous vehicle, a concept is been developed to investigate if multiple small autonomous machine could be more efficient than traditional large tractors and human forces.

Keeping the above ideology in mind, a unit with the following feature is designed:

- Robot has rotor which will destroy the unwanted grasses while moving and also level the ground.

- All the operations are performed with the help of PIC microcontroller.

- Humidity sensor is used to sense the moisture content in the environment.

- Moisture sensor is used to sense the water level in the ground and turn on and turn off the pumping motor depending on water level.

- The robot also has a digger to dig the vegetables from the ground.

- Bluetooth is used to send the message to the farmer about the operation performed by robot.

IV. FLOW CHART

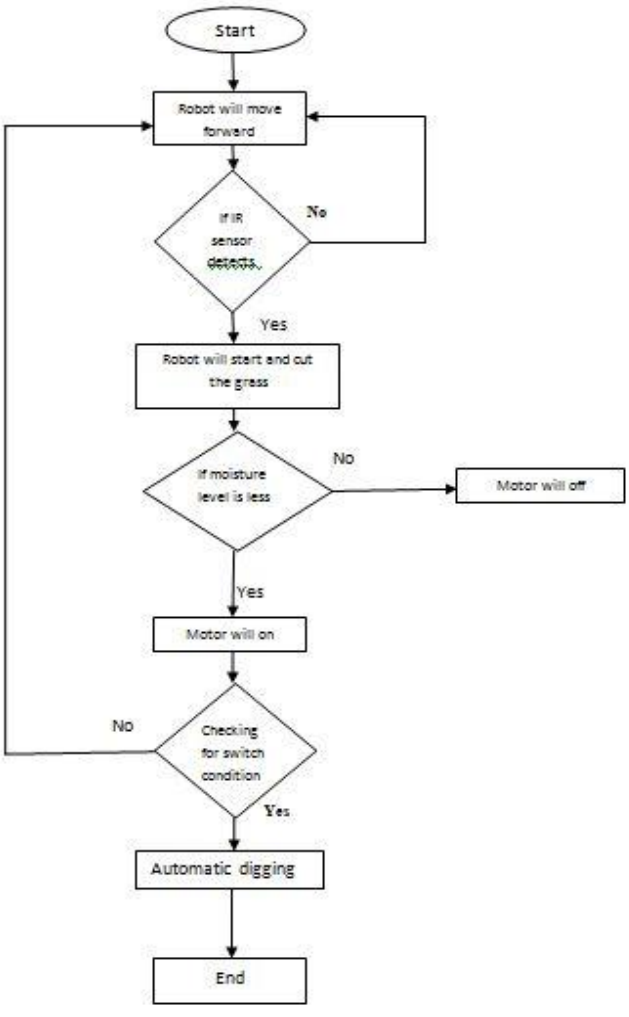

Fig: Flow chart of smart phone operated multipurpose agricultural robot

Step 1 - Power on the robot.
Step 2- Robot starts moving forward and all sensors powered on.
Step 3 - IR sensors senses for unwanted grass (or) weeds.
Step 4 - If IR sensor sense the presence of weeds (or) grasses then rotor starts rotating to cut grass (or) weed plants.
Step 5 - Moisture sensor is used to check moistness in the soil to water the plants.
Step 6 - If moisture sensor is low, sensor turns on the water pump (or) if moisture is high, sensor turns off the water pump.
Step 7 - Repeat Step 3 to Step 6 periodically.
Step 8 - Switch is used to turn on ploughshare for digging the field (or) farm.
Step 9 - Smart phone is connected to robot through Bluetooth interface app.

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Step 10 - Smart phone app scans the device, detects and connec the robot.
Step 11 - App server keeps records of operations (water irrigation/cutting weeds/ploughing land) with respect to time and amount of data transfer between phone and robot.

V. EXPERIMENTAL RESULTS

i. Introduction

Project is constructed as agribot (4 – wheeled robot) using PIC microcontroller 16F877A, IR sensors, Moisture sensors, Water pump motor, Motor driver, DC motor, Robotic arm, Switch, Rotor, Solar panel.

ii. Working

Agribot (4 – wheeled robot) is initiated with the power "ON". The agribot starts moving in forward direction along with the two sensors – IR sensor and Moisture sensors are also turned "ON". These are used to monitor the environment in real time. IR sensors are used to turn on rotor in order to cut the unwanted weeds (or) grasses. Likewise, moisture sensors are used to sense moistness in the soil and turn ON or OFF the water pump for watering the plants. Robotic arm is constructed by switch for ploughing the land.

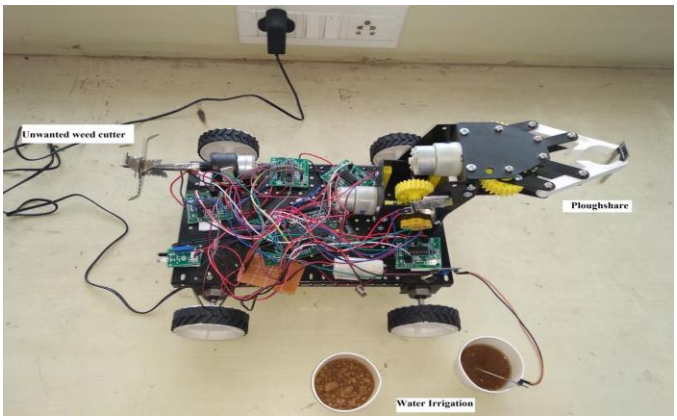

Fig 5.2: Working of the Agricultural robot

iii. Manual mode

Robot is operated in manual mode only for control purpose. It is used to start the Robot and make it move in forward direction. The three important mechanisms are – (i) Rotor is turned ON/OFF through IR sensors detecting unwanted grasses, (ii) Water pump is turned ON/OFF using moisture sensor based on detecting the moistness in soil. (iii) Robotic is turned ON/OFF through a switch for ploughing the land.

iv. Auto mode

Bluetooth interfaced android app is used to monitor the operation status of Robot. Steps involved in monitoring of Robot –

(1) Application scans for the Bluetooth interface (HC-05) Robot. (2) once, the robot connected to the phone successfully. (3) There are three 3 communication mode – (i) Byte stream mode, (ii) Keyboard mode, (iii) Command line mode. (4) Select Byte stream mode – Successfully connected. (5) In Byte stream mode, operational status of agribot – (i) Pumping motor ON (or) (ii) Rotor is on for leveling or removing grass. (iii) Robot is going to digging.

ADVANTAGES

i.Reduces the number of labors require for agricultural activity.
ii.Due its quick action time will be saved.
iii.Agribot can able to work in any environmental condition.
iv.The robots can work without sleep so they can work 24/7/365.
v. Protection against harmful effects of chemicals

APPLICATIONS

- Robot has rotor which will destroy the unwanted grasses while moving and also level the ground.
- The robot also has a digger to dig the vegetables from the ground.
- In Automatic turn on and turn off of water pumping motor.

VI. FUTURE WORK

Robotics is playing a significant role in agricultural production and management. There is a need for autonomous and time saving technology in agriculture to have efficient farm management. The researchers are now focusing towards different farming operational parameters to design autonomous agricultural vehicles as the conventional farm machineries are crop and topological dependent. Till date the agricultural robots have been researched and developed principally for harvesting, chemical spraying, picking fruits and monitoring of crops. Robots like these are perfect substitute for manpower to a great extent as they deploy unmanned sensing and machinery systems. The prime benefits of development of autonomous and intelligent agricultural robots are to improve repeatable precision, efficacy, reliability and minimization of soil compaction and drudgery. The robots have potential for multitasking, sensory acuity, operational consistency as well assuitability to odd operating conditions. The study on agricultural robotic system had been done using model structure design mingled with different precision farming machineries. Few prototypes were designed by European Union named CROPS, USA-ISAAC2 & Michigan-Hortibot, Australia-AgBot, Finland-Demeter, India-Agribot and many other countries. The agricultural robots are designed using different localization techniques which are vision, GPS, laser and sensor based navigation control system. In this paper, comparative study including an overview of Robotics approach for precision Agriculture in India and worldwide development is explored.

VII.CONCLUSION

In agriculture, the opportunities for robot-enhanced productivity are immense – and the robots are appearing on farms in various guises and in increasing numbers. The other problems associated with autonomous farm equipment can probably be overcome with technology. This equipment may be in our future, but there are important reasons for thinking that it may not be just replacing the human driver with a computer. It may mean a rethinking of how crop production is done. Crop production may be done better and cheaper with a swarm of small machines than with a few large ones. One of the advantages of the smaller machines is that they may be more acceptable to the non-farm community. The jobs in agriculture are a drag, dangerous, require intelligence and

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quick, though highly repetitive decisions hence robots can be rightly substituted with human operator. The higher quality products can be sensed by machines (color, firmness, weight, density, ripeness, size, shape) accurately. Robots can improve the quality of our lives but there are downsides. The present situation in our country all the agricultural machine is working on manual operation otherwise by petrol engine or tractor is expensive, farmer can't work for long time manually to avoid this problem, we need to have some kind of power source system to operate the digging machine.

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