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Development of Farmer assisting IoT based Seed Deployer

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Abstract - *Advancement of technologies such as the internet of Things (IoTs) has started to have a significant effect on our everyday lives in recent years. Manual processes involve Labour requirements and substantial hard work. The application of IoTs particularly in agro-industrial and environmental fields is very much in sight and demand. In this project an IoT-based seed deployer was developed. Here, four types of seeds were chosen each seed with different depths of sowing, row spacing and seed spacing. The Complete system consists of three components which are Deploying Mechanism, Seed Spacing Mechanism, and Interactive Dashboard that integrates the other two mechanisms to successfully deploy the seed. The Blynk app has been used to collect the user's input as a signal that will be sent to the Node MCU powering the Arduino pins. On the other hand, Arduino was used to control the wheel and the other to the servo engine. Parameters such as the servo angle and the delay were set based on seed size and number of seeds to be deployed. The distance moved by the rover can be altered according to the seed spacing required. The user can adjust those parameters according to his convenience*.

Key Words: Arduino Uno board, Node MCU Board, Arduino IDE, Blynk App, Servo Motor, L298N Controller, Li Po battery, DC motor

1.INTRODUCTION

The basic objective of sowing operation is to put the seed in rows at desired depth and spacing which vary from crop to crop for different agricultural and climatic conditions to achieve optimum yields. Cost of operation time, labor and energy can be limited from use of improved machinery for such operations. The Internet of Things (IoT) is the networking of everyday entities that comprises electronics embedded in their infrastructure for the purpose of communicating and sensing interactions between them or with respect to the external environment. The Objective is to develop an IoT based seed sowing machine which is less expensive and that can be used for different crops and sow the seeds with the help of Internet. Cloud computing and low powered embedded systems are main advantages in using IoT.

2. METHODOLOGY

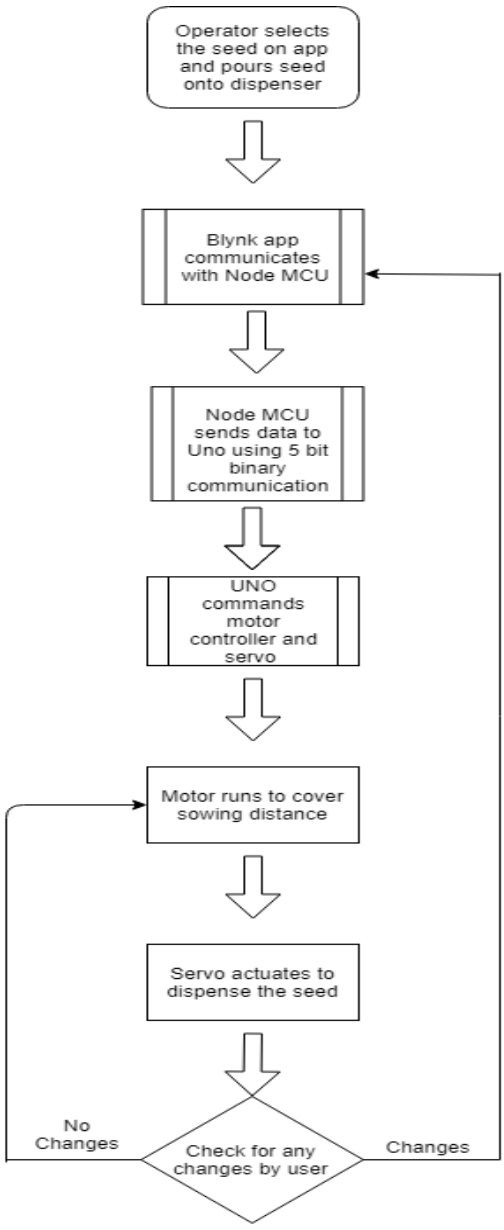

Fig – 1: Flowchart

2.1 Arduino Uno board

Arduino Uno is a microcontroller board that is open sourced based on the ATmega328 micro-chip. The board design uses a variety of digital And analog input and output pins which can also be integrated with various other boards. It has 14 digital pins, 6 analog pins, and can be programmed by using type B USB cable with the Arduino IDE (Integrated Development Environment). Though that accepts voltages between 7-20 volts, it can be powered by the USB cable or by an external 9-volt battery. The on-board ATmega328 comes preprogramed with a boot loader that allows you to upload new code to it without using an external hardware programmer.

Fig - 2: Arduino Uno Board

2.2 Node MCU Board

Node MCU is open source LUA-based firmware developed for Wi-Fi chip ESP8266. Node MCU firmware comes with Node MCU Development board, by exploring functionality with ESP8266 chip. The development board is equipping the ESP-12E module with an ESP8266 chip with Ten Silica Xtensa ® 32-bit LX106 RISC microprocessor that operates at an adjustable clock frequency of 80 to 160 MHz and supports RTOS. There is also 128 KB of RAM and 4 MB of Flash memory. The MCU ESP8266 Node has a total of 30 pins which interface it with the outside world.

Fig - 3: Node MCU Board

2.3 L298N Controller

The L298N is an integrated monolithic circuit in a 15- lead Multiwatt and PowerSO20 packages. It is a dual full-bridge driver of both high current and high voltage constructed to accommodate loads. There are dual inputs that disable or enable the device independent of the various inputs. It provides Broad output current with an instant peak current of up to 3A. It is a rated 25W power controller with up to 40 volts high operating voltage.

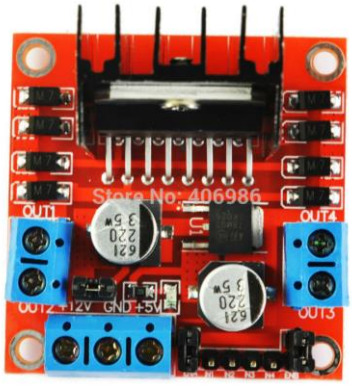

Fig - 4: L298N Controller

2.4 Servo Motor

A servo motor (or servo) is just a rotary actuator which allows accurate angular location, velocity, and acceleration. These motors run on a battery and spin at high RPM (rotations per minute) and very low torque. An arrangement of gears takes the motor's high speed and slows it down, thus increasing the torque. Positional rotation servo motor which has an output shaft that rotates in about half of a circle, or 180 degrees was used in the model.

Fig - 5: Servo Motor

2.5 Li Po battery

Lithium-ion polymer battery is a lithium-ion rechargeable battery. Instead of a liquid electrolyte it uses polymer electrolyte. This electrolyte is formed by high conductivity semisolid (gel) polymers. These batteries have higher specific energy than other types of lithium batteries, and are used in applications such as mobile devices where weight is a critical feature. Li Po cells have persuasive advantages for manufacturers. They can easily produce batteries of just about any shape they want and has long life.

Fig - 6: Li Po battery

2.6 DC motors

DC motor is one of a class of rotary electric motors which converts electrical direct current into mechanical energy. The most common forms depend on magnetic-field forces. Every DC motor has some or the other internal mechanism, electronic either or electromechanical, to change the current direction in a part of the motor periodically. DC motors were the first widely used form of motor, as they could be powered from existing direct-current distribution systems. The speed of a DC motor can be controlled over a wide range, either by using a variable supply voltage or by changing the current strength in its field windings. Small DC motors are used in tools, appliances and toys. The universal motor is capable of running on direct current but is a lightweight brushed motor used for portable power tools and appliances.

Fig - 7: DC Motor

2.7 Chassis

The chassis is the mechanical external structure that incorporates every single component of the system. Here the chassis consists of a platform that is mounted with DC motors on the bottom. A funnel for seed storage which is attached to a servo mechanism to control the dropping of seed. The chassis also features a Full+ breadboard for circuit connections. This chassis is compatible with all the above-mentioned hardware components connected by jumper wires. The actual model is shown in Fig-13.

2.8 Software

2.8.1 Arduino IDE

The Arduino Integrated Development Environment (IDE) is a cross-platform application written in C and C++ features, for Windows, macOS, Linux, etc. It provides a library which provides a number of procedures to output and input operations. Only two basic functions in any code written by user is required to have it compiled. It was used for programing all types of boards compatible with Arduino.

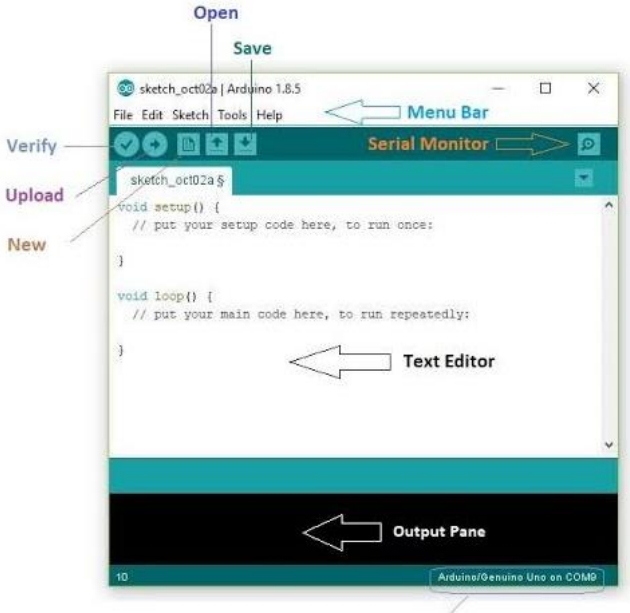

Fig - 8: Arduino IDE interface

2.8.2 Blynk App

Blynk is designed for the Internet of Things. It remotely controls hardware, can display sensor data, store data and even visualize data. Blynk App creates amazing interfaces with the help of different widgets. It provides Blynk Server is responsible for all Smartphone and Hardware communications. It is an open-source app which can easily handle thousands of devices and can even be launched on a Raspberry Pi. Blynk Libraries is used for all the popular hardware platforms since it processes all incoming and outgoing commands and allows communication with the server. It was used to give input signal to Arduino board through node MCU boards.

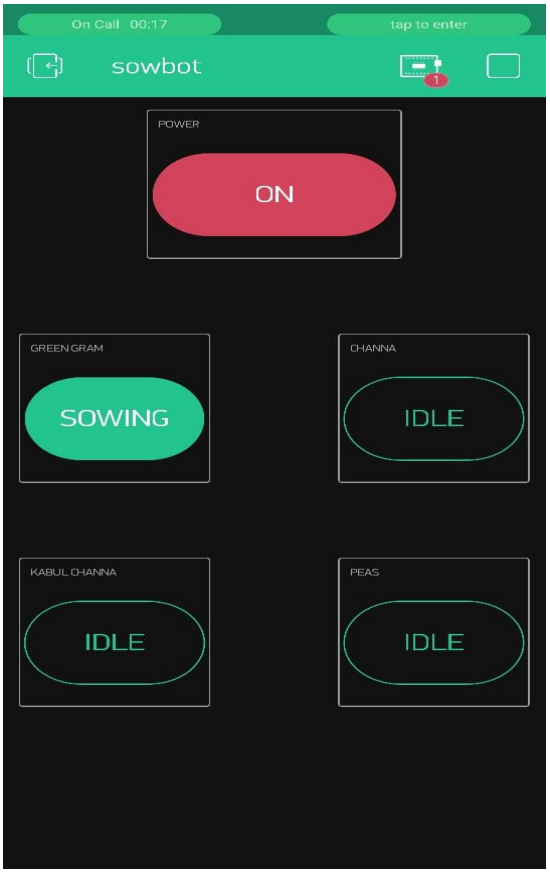

Fig - 9: Blynk app

3. Input parameters

Four different types of seeds were selected and they are green gram, peas, black Chana, Kabul Chana. Parameters like seed spacing, servo angle and servo distance were chosen for these seeds based on seed size, shape, etc.

3.1 Calculations

Speed of wheel rotation = 2 rps (rotations per second)

Diameter of the wheel = 6 cm

Distance moved in 1 rotation = π x 6cm = 18.85 cm

Distance moved in 1 second = 18.85 x 2 = 37.7cm

Time for 10cm movement = 10/37.7 = 275 milliseconds

On similar lines time for 25cm,30cm &35 cm movements were calculated.

Table-1: Input parameters for different seeds

Input Data					
Sl No.	Seed type	Seed spacing (cm)	Time of rover movement (millisec)	Servo angle (deg)	Servo delay time (millisec)
1	Green gram	10	275	10	100
2	Peas	25	663	20	150
3	Black Chana	30	795	30	200
4.	Kabul Chana	35	928	40	250

4. Circuit and Connections

All the circuit connections are shown in Fig – 10.

- D0 to D5 pins on Node MCU are connected to D3 to D7 respectively on Uno for 5 bit binary communication.
- D9 on Uno is connected to servo signal pin
- D10 and D12 are connected to L298N controller.
- All grounds and supplies are shorted.

5. Working

Blynk app was used to link the seed dispensing rover to the mobile device. Node MCU connects with the Blynk app. A signal is sent to the Node MCU when a user presses a switch which is connected to a hotspot through the internet. For communication between Node MCU and Arduino Uno module, a 5-bit binary logic is used. All the four seeds are given different identities in the form of 5-bit binary number. 5 Node pins MCU attaches to 5 Arduino Uno board pins. Signal unique to that seed is generated when seed 1 is selected, which supplies power to the corresponding Arduino pin. This way Arduino can recognize the seed type chosen. Uno then sends two signals, one to motor wheels and other to the servo motor. The rover does the movement. After that process is finished, the Arduino tests for signal change. If no signal change occurs, then rover executes the motion again. If the Arduino detects any change in signal, it stops the previous process and executes the new command.

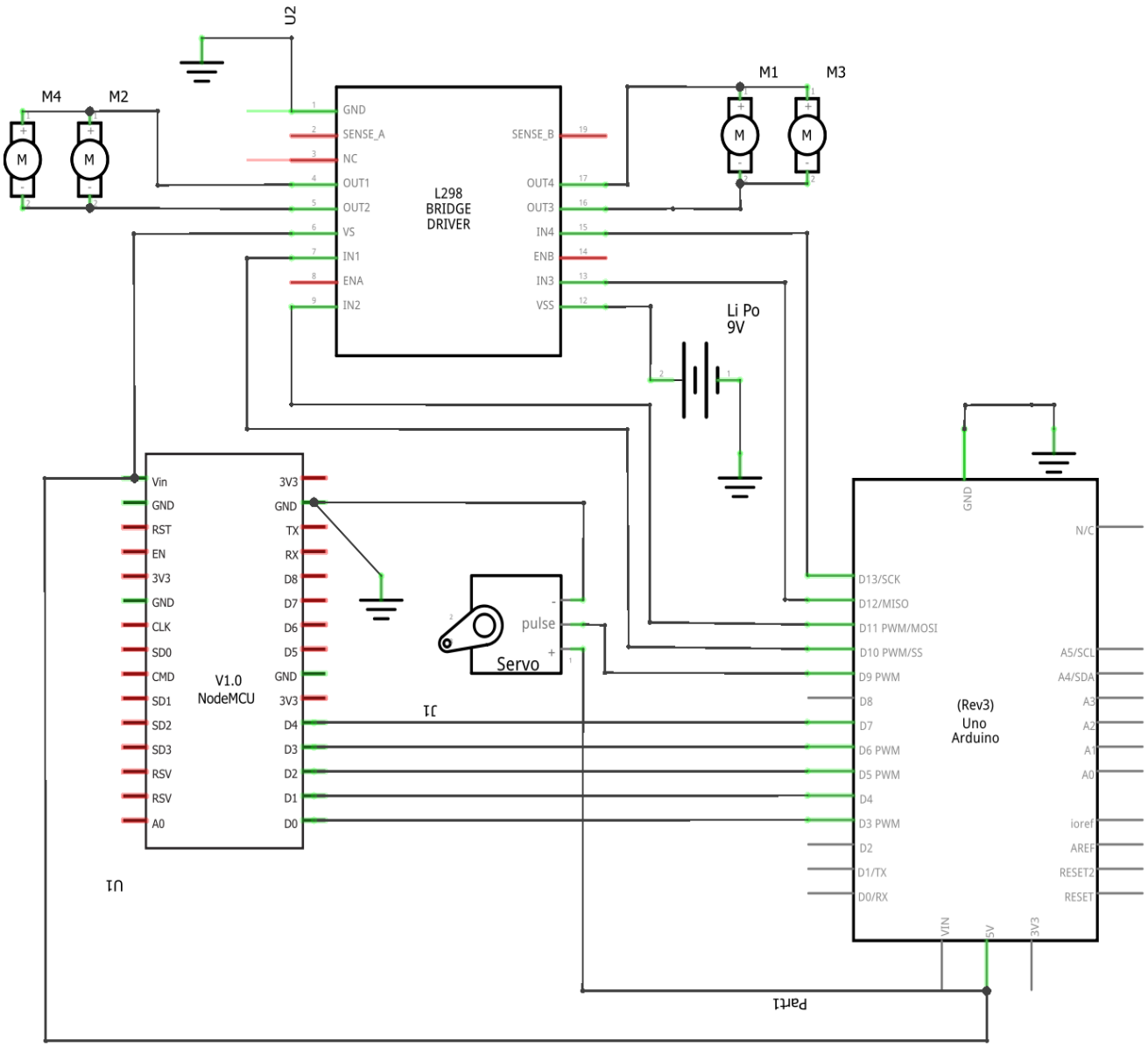

Fig - 10: Schematic circuit

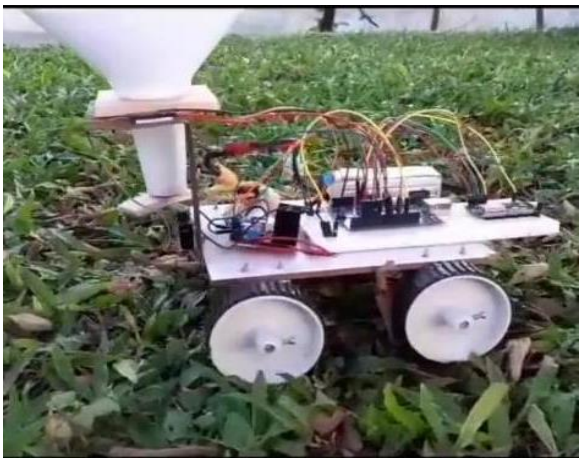

Fig - 11: servo at zero position

Fig - 12: servo movement for seed dispensing

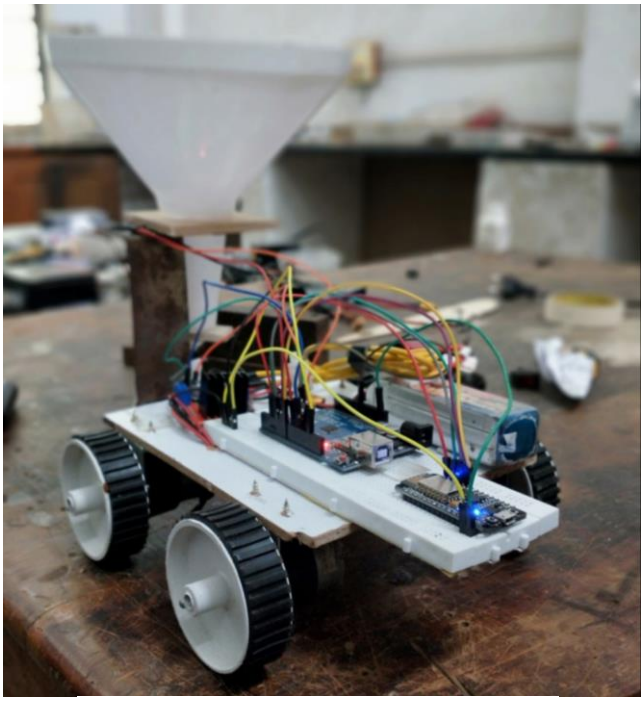

Fig - 13: Actual model

6. CONCLUSION

The project "Development of Farmer assisting IoT based seed deployer" has been developed in the domain of "Internet of Things". The basic principles and the working of IoT have been seen in the phase run. The project mainly uses computer programming concepts and an Arduino Board. The project demonstrates how technology can be used to enhance the simple Seed deployment process in agriculture. The seed sowing machine is capable of deploying the seed remotely without human intervention. Components such as Arduino Uno Board, Node MCU, Motor Driver, and Servo Motor were used. The project automates the time consuming seed deploy process. The user can control the rower's motion while sitting at their homes, at the fingertips.

7. FUTURE SCOPE

The present project can be made more promising by adding obstacle identification and a drilling system that will further assist in precise field ploughing and seed sowing. while sitting at their homes, at the fingertips. The use of camera module and humidity sensor would further increase the machine 's applicability. While this camera shows the seed being sown in real time, the moisture sensor measures the moisture in the soil at various points and supplies the data to the irrigation system so that water can be used sensibly.

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