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FABRICATION OF WHEEL TYPE FERTILIZER SPRAYER WITH MOBILE CONTROLLER

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Abstract:

Sugarcane is most widely grown crop in India due to rapid development in sugar industry in India. Sugarcane is grown on around 2.8% of gross cropped area of India. To achieve good yield of sugarcane crop use of fertilizers is obvious. Fertilizers provide plants with the essential chemical elements needed for growth particularly nitrogen, phosphorus and potassium. Solid chemical fertilizers are one of important sources for plant nutrition they provide the plant with important nutrients needed for growth during the periods of its growing life, and also it works to improve the properties of soil (soil structure and the degree of acidity). The objective of this invention is to provide a simple and inexpensive fertilizer spreader, in a form of a 'walk-behind' device which may be easily and quickly pushed by the farmers for spreading solid fertilizers like urea. This is a type of spreader which can be operated manually for spreading granular materials in farms especially for solid fertilizers like urea. When the vehicle is pushed, motion is transferred from rear axle wheels which in turn transmits rotational motion through sprocket (mounted on rear axle) and chain mechanism which in turn rotates second sprocket connected to a shaft having screw conveyor at both the ends. This rotation of screw conveyor will discharge the fertilizer which is supplied through a hopper acting as storage tank.

I.INTRODUCTION

From years ago the majority of Indian population depends on agriculture. Even today around 61.5% of rural Indian population depends on agriculture for their bread and butter. Agriculture always play an important contribution in the GDP of India (currently 17.9% of GDP). Tropical region shared about 45% and 55% of the total sugarcane area and production in the country, respectively along with the average productivity of 77 t/ha (2011-12). Sub-tropical region accounted for about 55% and 45% of total area and production of sugarcane with an average productivity about 63 t/ha (2011-12).

The tropical sugarcane region consists of sugarcane agro climatic zone 4 (Peninsular zone) and 5(Coastal zone) which includes the states of Maharashtra, Andhra Pradesh, Tamil Nadu, Karnataka, Gujarat, Madhya Pradesh, Goa, Pondicherry and Kerala. Sugarcane is most widely grown crop in India due to rapid development in sugar industry in India. Sugarcane is grown on around 2.8% of gross cropped area of India. India produced around 350 million tons of sugar in 2013-14. To achieve good yield of sugarcane crop use of fertilizers is required. Fertilizers provide plants with the essential chemical elements needed for growth particularly nitrogen, phosphorus and potassium

II. LITERATURE REVIEW:

Feasibility Study of DTMF Communications for Robots", UWEE Technical Report, Number UWEETR-2004-0013, April 6, 2004

This technical report summarizes a year-long undergraduate research project by the first author. As the development of individual and cooperating autonomous robots advances, the need for a robust and reliable communication method becomes apparent. This paper summarizes a study conducted to examine the feasibility of implementing Dual-Tone, Multi-Frequency (DTMF) as an alternative mean of communication to Radio Frequency (RF). With advantages of simplicity and audibility, the hypothesis is that DTMF could replace RF in simple communications between robots or robots and devices. The conclusion is that acoustic communication in general not recommended for mobile robot applications due to the unreliability in acoustical integrity of the signal during transmission.

Y. Chen, B. A. MacDonald, and B. Wunsche, "Mixed reality simu- ¨ lation for mobile robots," in IEEE Intl Conf Robotics and Automation, Kobe, Japan, May 2009, pp. 232–237.

A Mixed Reality (MR) simulation aims to enable robot developers to create safe and close-to-real world environments from a mixture of real and virtual components for experimenting with robot systems. However, the reliability of the simulation results and its usefulness in solving practical problems remain to be validated. This paper presents an evaluation of an MR simulator by examining its use for the development of a robotic screw remover system. Quantitative evaluation compares the robot's trajectories produced in our MR simulation with those from a real world experiment, yielding results that indicate the MR simulation reliably represents the real world. A user study was conducted and the results demonstrate that the MR simulator gives users a stronger confidence of accurate results in comparison to a virtual simulator.

III. PROBLEM IDENTIFICATION:

- Mostly in India we used the old method and equipment for the agriculture. For agriculture the pesticide and water is mostly required after the some interval of time to remove the insect from the agriculture land. In old equipment only one work has been performed at a time due to which the time as well as effort required is more. To remove the insect from the land we first put the pesticide and after that we give the water or another pesticide due to lack of technology. Even we required at the same time two pesticide.
- Objective of the present work is to design and develop wheel operated
- Fertilizer sprayer, which operates on the motion produced by wheels of the trolley. On the shaft of those two wheels one sprocket is mounted. Rotary motion of that sprocket is converts into reciprocating motion by using slider-crank mechanism. By using this reciprocating motion
- Fertilizer is compressed at sufficient pressure in compressor. This compression process will divide that fertilizer into tiny particles. And thus by using few nozzles this fertilizer is sprayed on the crops.

IV. METHODOLOGY :

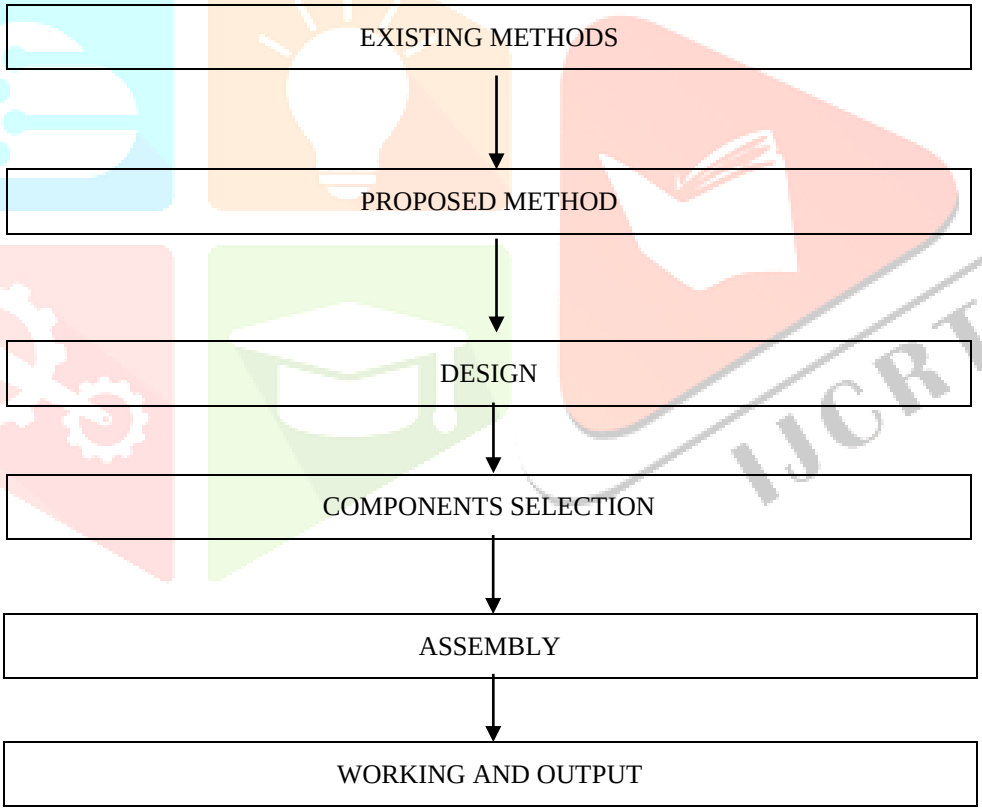

Fig .4.1 .Work plan of fertilizer spray

V. MODELLING AND CALCULATIONS:

```
char t;
void setup() {
pinMode(13,OUTPUT);   //left motors forward
pinMode(12,OUTPUT);   //left motors reverse
pinMode(11,OUTPUT);   //right motors forward
pinMode(10,OUTPUT);   //right motors reverse
pinMode(9,OUTPUT);   //Led
Serial.begin(9600);

}

void loop() {
if(Serial.available()){
t = Serial.read();
Serial.println(t);
}

if(t == 'F'){            //move forward(all motors rotate in forward direction)
digitalWrite(13,HIGH);
digitalWrite(11,HIGH);
}

else if(t == 'B'){      //move reverse (all motors rotate in reverse direction)
digitalWrite(12,HIGH);
digitalWrite(10,HIGH);
}

else if(t == 'L'){      //turn right (left side motors rotate in forward direction, right side motors doesn't rotate)
digitalWrite(11,HIGH);
}

else if(t == 'R'){      //turn left (right side motors rotate in forward direction, left side motors doesn't rotate)
digitalWrite(13,HIGH);
}

else if(t == 'W'){    //turn led on or off)
digitalWrite(9,HIGH);
}
else if(t == 'w'){
digitalWrite(9,LOW);
}
```

```
else if(t == 'S'){      //STOP (all motors stop)
digitalWrite(13,LOW);
digitalWrite(12,LOW);
digitalWrite(11,LOW);
digitalWrite(10,LOW);
}
delay(100);
}
```

VI. MALIRIALS SELECTION

Arduino

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.

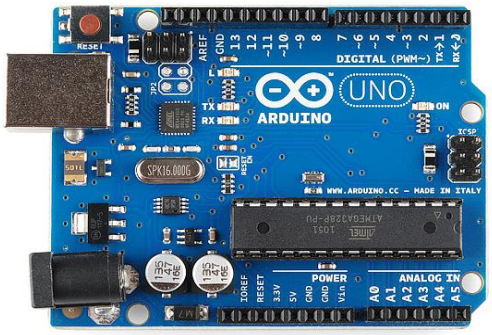

Fig .6.1. arduino

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments. All Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too, is open-source, and it is growing through the contributions of users worldwide.

VII.BLUETOOTH:

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup.

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). It has the footprint as small as 12.7mmx27mm. Hope it will simplify your overall design/development cycle.

VIII. HARDWARE FEATURES

- Typical -80dBm sensitivity
- Up to +4dBm RF transmit power
- Low Power 1.8V Operation ,1.8 to 3.6V I/O
- PIO control
- UART interface with programmable baud rate
- With integrated antenna
- With edge connector

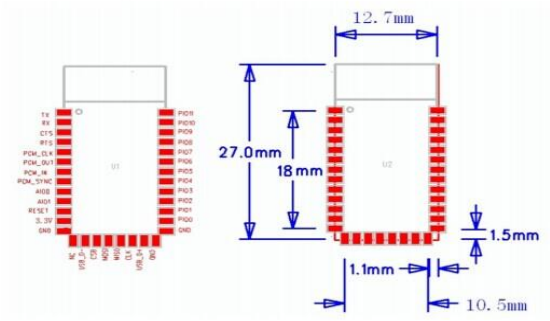

Fig.8.1 hardware features

Nozzles

Liquid fertilizers can be easily applied with specially adapted technology from Lechler. Nozzles, the dropleg and hose drops systems ensure an exact, uniform and precise distribution of the liquid fertilizer. Your economic success in the use of liquid fertilizers can thus be improved and secured.

Fig.8.2 nozzle

IX. Battery Sprayer Motor 12V

Earth Heavy Duty *Battery Sprayer Motor* 12V +1.7 *pump* charger free: ... You Save: ₹ 340.00 (*35*%) ... Compact and light weight, easy to install *with* a long lifespan; 12V high pressure diaphragm *waterpump with* pressure switch and threaded interfe ... Widely applied in general Package includes: *1* Pcs Water *Pump* Mini.

Fig.9.1 battery sprayer motor 12v

1. Watering configuration: much the same, additional sprinklers and timers are required
2. 12V DC reflux diaphragm pump 550, the price is the price of a pump, without other accessories
3. Maximum pressure: 0.48MP.
4. Voltage: 12V, current: at least 2A, measured 1A is not able to bring
5. Suction: 3 meters or so, preferably 2 meters (no problem if the vertical height is 1.5 meters).
6. Head: 4-5 meters (head is not shot)
7. Highest temperature resistance 55°
8. Flow rate: 3.5L/min

X. FACTORS DETERMINING THE CHOICE OF MATERIALS

Properties The material selected must possess the necessary properties for the proposed application. The various requirements to be satisfied can be weight, surface finish, rigidity, ability to withstand environmental attack from chemicals, service life, reliability etc.

The following four types of principle properties of materials decisively affect their selection

a. Physical

b. Mechanical

c. From manufacturing point of view

d. Chemical

The various physical properties concerned are melting point, Thermal Conductivity, Specific heat, coefficient of thermal expansion, specific gravity, electrical Conductivity, Magnetic purposes etc.

The various Mechanical properties Concerned are strength in tensile, compressive shear, bending, torsional and buckling load, fatigue resistance, impact resistance, elastic limit, endurance limit, and modulus of elasticity, hardness, wear resistance and sliding properties.

Fig.10.1 factors determining the choice of materials

Manufacturing Case

Sometimes the demand for lowest possible manufacturing cost or surface qualities obtainable by the application of suitable coating substances may demand the use of special materials.

Quality Required

This generally affects the manufacturing process and ultimately the material. For example, it would never be desirable to go for casting of a less number of components which can be fabricated much more economically by welding or hand forging the steel.

Availability of Material

Some materials may be scarce or in short supply. It then becomes obligatory for the designer to use some other material which though may not be a perfect substitute for the material designed.

Space Consideration

Sometimes high strength materials have to be selected because the forces involved are high and the space limitations are there.

Fig.10.2.space consideration

XI. CONCLUSIONS

An initial outcome of this study indicates that most of these systems that which work autonomously are more flexible than traditional systems. The benefits of reduction in labor costs and restrictions on the number of daily working hours significantly improved. Thus it has made possible to automate the most significant working routines. The project presents a low cost, low power & simple system for device control. This system will have high application in farming, gardening and Agro University. By implementing this system, agricultural, horticultural lands, gardens can be irrigated. Thus, this system is cheaper and efficient when compared to other type of automation system. In large scale applications, high sensitivity sensors can be implemented for large areas of agricultural lands. Thereby reducing the stress on farmers.

XII. REFERENCES

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