Smart Agriculture Ploughing tool for Agriculture using Embedded System.

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INTRODUCTION

In today the environmental influence of agricultural production is very much in focus and the demands to the industry is increasing. Now a days everything is becoming compact, portable and mobile. The mobile communication have made our lives much simpler and connected. Today almost everyone is familiar with its usage of mobile, and is able to draw advantage from it. TheBluetooth technologies for mobile communication have been evolving. This wireless technology standard for exchanging data over short distance using short wavelength radio transmission in the ISM band. It is a digital telephony system, used in most part of the world.

Also a pair bullocks is used to carry the heavy equipment of leveling and ploughing. There is need to study on upgrading agricultural equipment. The energy needed for robotic machine is less as compared with other machine like tractors or any agriculture tools.

In our project we present an agriculture tool for ploughing using PIC that employs the movement of direction through contactless(wireless) communication. Driverless robots are designed to replace human labor.In this paper performs ploughing and powered by solar panel with a control of android mobile.

Golakotta.A.,Shrinivas.M.B.,(2011)have proposed that multipurpose agricultural robot was designed to be used for a number of different tasks including deployment as a multi-purpose light weight robotic carrying platform,as a sensor platform to monitor crops and soils and potentially,as a platform to manage crops and for precision weed control.It is capable of operating on uneven terrain and is agile enough to navigate between rows of crops without touching plants. In much of our agri-tech research, the fields we use are our laboratory, which brings its own technical and logistical challenges with certain experiments. The robot will support research on autonomous outdoor navigation and mapping, soil quality assessment, crop yield prediction, in field logistics and transportation.

Swati D., Sambare, Belsare S.S, (2015) have focused that our wholeeconomy is based on agriculture. Agriculturalfield involves the effective production of food, feed, fiber and other goods for humans and animals.Also agriculture includes operations like production of cut flowers, timber, ferti-

lizers, animal hides, leather, and industrial chemicals.Heavy material handling is required in the farming operations. For example,in vegetable cropping, handling ofheavy vegetables in organic farming, handling of heavy compost bags. As compared to other fields, globalization and development in agriculture field is less. So, it is necessary to make some advancement in this field. Today's agricultural field demands to find new ways of agricultural operation to improve performance efficiency. In the field of agriculture various problems are faced by the farmers in the operations like seed sowing, pesticidespraying,weeding.Also the equipment used to perform theoperations are very heavy. Due to migration of humans in the cities the labor problem occurs. Nowadays robotics technology plays a paramount role in all sections like medical field, industries and various organizations. In other countries robots are used to perform different operations in the agricultural field. We can make the use of available technologies and the robotics technology the farming system to reduce the efforts of farmers.

Rahul Batta, Mahesh Kumar, Rupinder Chandel (2015)have present the mostly solid manure is spread using broadcasting equipment or traditional method followed by tillage incorporate the manure into the soil. Delayed incorporation result in increased odor, risk of nutrients loss in runoff and volatilization losses of manure nitrogen. The problem faced during manure is considered as the eco-friendly bio-fertilizer for the highly polluted modern era. The farmyard manure application is a basic input operation in crop production.Manure to the land isessential to prevent pollution of land,ground and surface water and to prevent loss of ammonia and other nutrients from the manure.

CHAPTER 3
SYSTEM ANALYSIS

3.1 EXISTING SYSTEM

In traditionally drawn by working animals such as horses and later are drawn by tractors. This primary purpose is to turn over the upper layer of the soil and modifies the upper 12 to 25 cm of the soil. It results heavy load on the agricultural land which increasing the density of the soil and also which cost more man power. It is used for the cultivation fuel based machinery results in polluting the environment.

Fig. 3.1 Existing Ploughing Tool
3.1.1 DISADVANTAGES
- ✓ Major soil erosion.
- ✓ Highest fuel and labor cost.
- ✓ Destroy soil structure.

3.2 PROPOSED SYSTEM

In our project the tool is highly portable even it works on small gap between the crops. In this paper contactless (wireless) mode of communication is used for portability. It is an electro mechanical tool which operates on renewable energy. There was no possibilities for polluting the agriculture land.
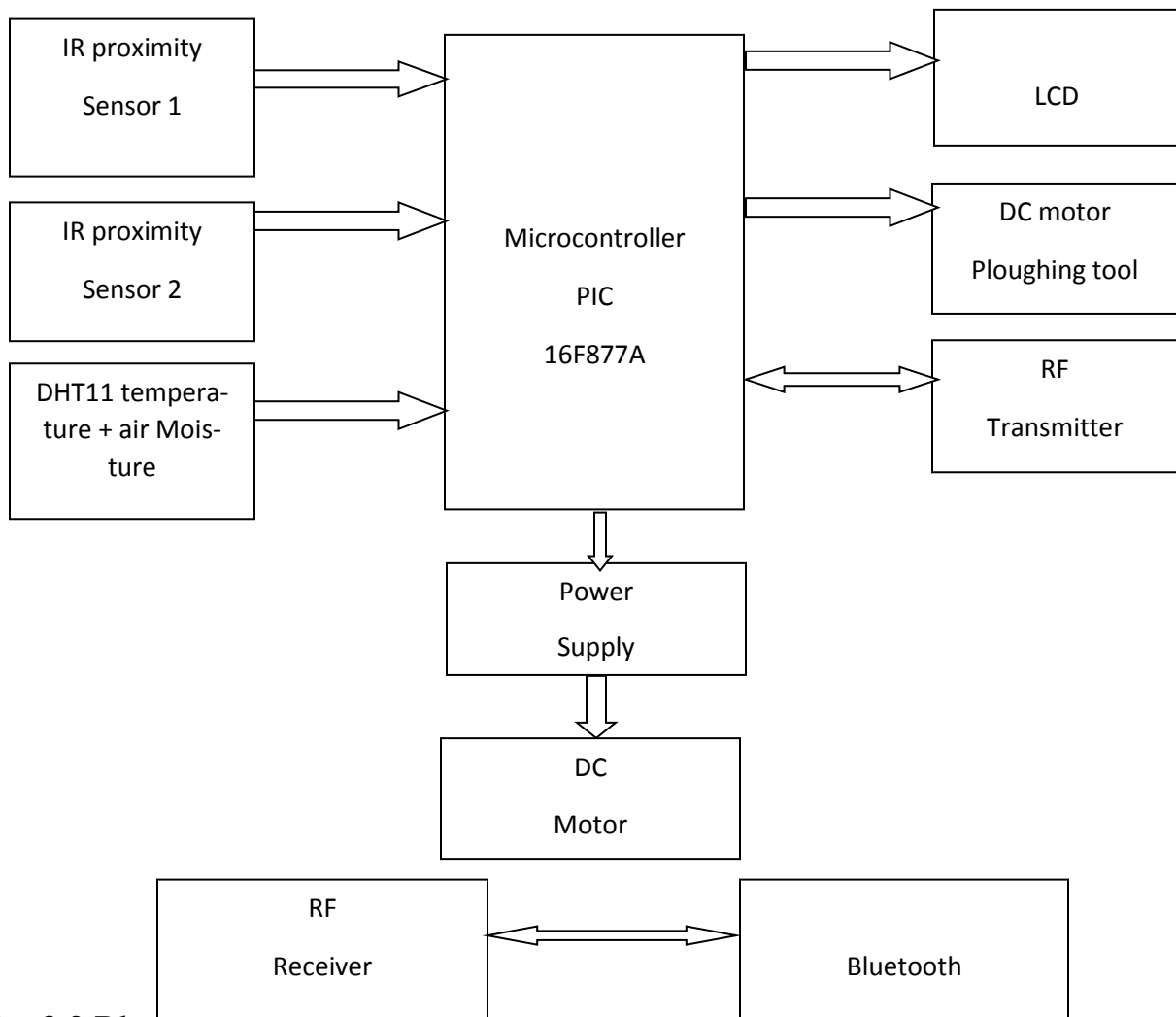

Fig. 3.2 Block diagram of ploughing tool

3.2.1 ADVANTAGES

- ✓ Economic and energy efficient.
- ✓ Man power and wage could be reduced.
- ✓ Environment eco-friendly.
- ✓ Low power consumption.
- ✓ Suited for poorly drained soils.
- ✓ Excellent incorporation.
- ✓ Well tilled seedbed.
- ✓ Less winter wind erosion from roughened surface.
- ✓ Excellent for furrow irrigation.

CHAPTER-4   METHODOLOGY

The process is carried out by the microcontroller assembly. The ploughing tool of the land is based on fixed hardware distance. The main hardware blocks of our model are

- ❖ Controller unit
- ❖ LCD module
- ❖ Bluetooth
- ❖ DC motor
- ❖ Power supply
- ❖ DHT11 sensor
- ❖ IR sensor
- ❖ RF Transmitter & Receiver

4.1 CONTROLLER UNIT

This is said to the brain of the project since it controls the entire working model by collecting the information. PIC microcontroller is used for interfacing components in the device. The PIC 16F877A is used here.

4.1.1 MICROCONTROLLER

Microcontroller is designed to play an increasingly important role in revolutionizing various industries and influencing our day to life more strongly than one can imagine. Since it emergence in the early 1980's the microcontroller has been recognized as a general purpose building block intelligent digital systems. It finds use in diverse area, starting from simple children's toys to highly complex spacecraft. Because of its versatility and many advantages, the application domain has spread in all conceivable directions.

4.1.2 CENTRAL PROCESSOR UNIT (CPU)

I'm not going to bore you with the operation of the CPU at this stage, however it is important to state that the CPU is manufactured with in RISC technology an important factor when deciding which microprocessor to use.

RISC Reduced Instruction Set Computer gives the PIC16F887 two great advantages:

- ✓ The CPU can recognize only 35 simple instructions (In order to program some   other microcontrollers it is necessary to know more than 200 instructions by heart).
- ✓ The Jump and Branch instructions execution time is 2 clock cycles.
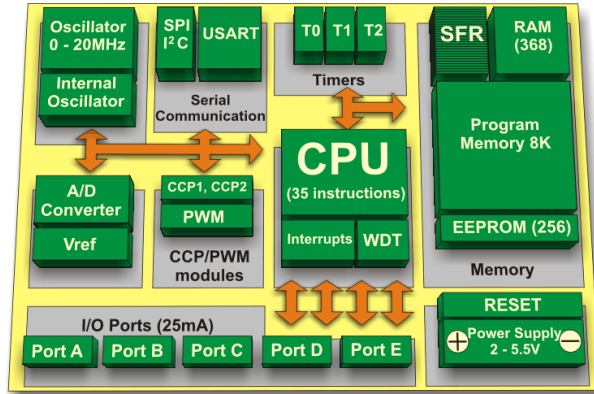
4.1.4 BLOCK DIAGRAM

Fig. 4.2 Block diagram of PIC

4.2 LCD

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being:

✓ LCDs are economical
✓ Easily programmable
✓ Have no limitation of displaying special characters.
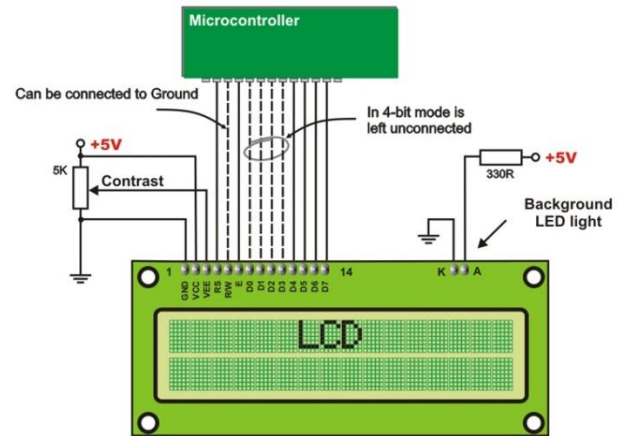

Fig. 4.4 Implementation of LCD in Micro-controller

✓ LCD module is the very common type of LCD module that is used in 8051 based in embedded.
✓ It consists of 16 rows and 2 columns of 5x7 or 5x8 LCD dot matrices.
✓ The module were are talking about here is type number JHD162A which is a very popular one.
✓ It is available in a 16 pin package with back light, contrast adjustment function and each dot matrix has 5x8 dot resolution.
✓ It has two built in registers namely data register and command register.
✓ Data register is for placing the data to be displayed, and the command register is to place the commands.
✓ The 16x2 LCD module has a set of comments each meant for doing a particular job with the display.
✓ High logic at the RS pin will select the data register and low logic at the RS pin will select the command register.

4.3.3 MOBILE PHONE REQUIRMENTS

A Bluetooth-enabled mobile phone is able to pair with many devices. Toensure the broadest feature functionality together with compatibility with legacy devices, the Open Mobile Terminal Platform (OMTP) forum has published a recommendations paper, entitled "Bluetooth Local Connectivity".

Fig. 4.6 Rotation of DC motor

4.4 DC MOTOR

In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. As you are well aware of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion.Let's start by looking at a simple 2-pole DC electric motor (here red represents a magnet or winding with a "North" polarization, while green represents a magnet or winding with a "South" polarization).
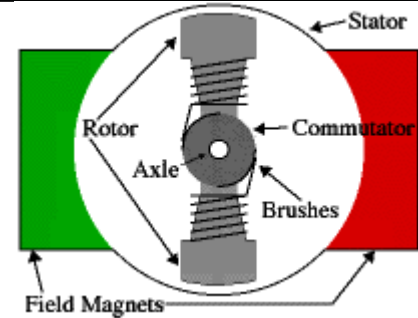
Every DC motor has six basic parts -- axle, rotor (a.k.a., armature), stator, commutator, field magnet(s), and brushes. In most common DC motors (and all thatBEAMers will see), the external magnetic field is produced by high-strength permanent magnets. The stator is the stationary part of the motor this includes the motor casing, as well as two or more permanent magnet pole pieces. The rotors (together with the axle and attached commutator) rotate with respect to the stator. The rotor consists of windings (generally on a core), the windings being electrically connected to the commutator. The above diagram shows a common motor layout with the rotor inside the stator (field) magnets.

A D.C. Motor is a machine which converts electrical energy into mechanical energy. Its location is based on the principal that when a current carrying conductor is placed in the magnetic field, it experiences a mechanical force whose direction is given by Fleming's left hand rule.
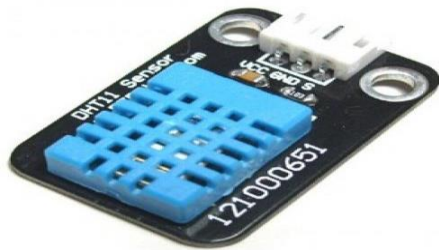
4.5 DHT 11 Humidity & Temperature Sensor

Fig. 4.7 DHT11 sensor

This DFRobot DHT11 Temperature & Humidity Sensor features a temperature & humidity sensor complex with a calibrated digital signal output. By using the exclusive digital-signal-acquisition technique and temperature &humidity sensing technology, it ensures high reliability and excellent long-term stability. This sensor includes a resistive-type humidity measurement component and an NTC temperature measurement component, and connects to a high-performance 8-bit microcontroller, offering excellent quality, fast response, anti-interference ability and cost-effectiveness.

4.5.1 Technical Specifications

Item	Measurement range	Humidity accuracy	Temperature Accuracy	Resolution	Package
DHT 11	20-90% RH 0-50^{0}c	5% RH	2^{0}c	1	4 pin single row

Table4.2 sensor specification

DHT11's power supply is 3-5.5V DC. When power is supplied to the sensor, do not send any instruction to the sensor in within one second in order to pass the unstable status. One capacitor valued 100nF can be added between VDD and GND for power filtering.

4.6 IR SENSOR

We have already discussed how a light sensor works. IR sensors work by using a specific light sensor to detect a select light wavelength in the Infra-Red (IR) spectrum. By using an LCD which produces light at the same wavelength as what the sensor is looking for, you can look at the intensity of the received light. When an object is close to the sensor,the light from the LCD bounces off the object and into the light sensor. This results in a large jump in the intensity, which we already know can be detected using a threshold.

Fig. 4.8 IR sesnsor

4.7 RF TRANSMITTER & RECEIVER

The RF module, as the name suggests, operates at Radio Frequency. The corresponding frequency range varies between 30 kHz & 300 GHz. In this RF system, the digital data is represented as variations in the amplitude of carrier wave. This kind of modulation is known as Amplitude Shift Keying (ASK).

Transmission through RF is better than IR (infrared) because of many reasons. Firstly, signals through RF can travel through larger distances making it suitable for long range applications. Also, while IR mostly operates in line-of-sight mode, RF signals can travel even when there is an obstruction between transmitter & receiver. Next, RF transmission is more strong and reliable than IR transmission.
RF communication uses a specific frequency unlike IR signals which are affected by other IR emitting sources.

This RF module comprises of an RF Transmitter and an RF Receiver. The transmitter/receiver (Tx/Rx) pair operates at a frequency of 434 MHz. An RF transmitter receives serial data and transmits it wirelessly through RF through its antenna connected at pin4. The transmission occurs at the rate of 1Kbps to 10Kbps.The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter.

The RF module is often used along with a pair of encoder/decoder. The encoder is used for encoding parallel data for transmission feed while reception is decoded by a decoder. HT12E-HT12D, HT640-HT648, etc. are some commonly used encoder/decoder pair ICs.
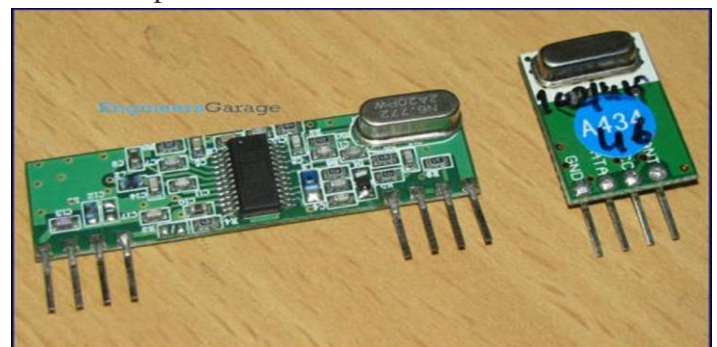

Fig. 4.9 RF transmitter & receiver

4.10 ANDROID MOBILE

Android is a mobile operating system (OS) based on the currently developed by Google. With a user interface based on direct manipulation,android is designed primarily for touch screen mobile devices such as smartphones and tablet computers, with specialized user interfaces for televisions, cars and wrists.

CHAPTER 5
POWER SOURCE

This power source block consists of a step-down transformer, a bridge rectifier, a capacitor and a voltage regulator. Single-phase active current power supply from the mains is step down to a lower voltage range which is again   rectified to direct current by using a bridge rectifier. This rectified direct current is filtered and regulated to the whole circuit operating range with a capacitor and voltage regulator IC, respectively.

5.1 STEP-DOWN TRANSFORMER

When AC is applied to the primary winding of the power transformer it can either be stepped down or up depending on the value of DC needed. In our circuit the transformer of 230v/0-12v is used to perform the step down operation where a 230V AC appears as 12V AC across the secondary winding. One alteration of input causes the top of the transformer to be positive and the bottom negative. The next alteration will temporarily cause the reverse. The current rating of the transformer used in our project is 1A.

5.2 CHARGING UNIT

In our project in the charging unit consider two components are,

- ✓ Battery
- ✓ Solar panel

5.2.1 BATTERY

An electric **battery** is a collection of one or more electrochemical cells in which stored chemical energy is converted into electrical energy. The principles of operation haven't changed much since the time of Volta. Each cell consists of two half cells connected in series through an electrolytic solution. One half cell houses the **Anode** to which the positive ions migrate from the **Electrolyte** and the other houses the **Cathode** to which the negative ones drift. The two cells are may be connected via a semi permeable membranous structure allowing ions to flow but not the mixing of electrolytes as in the case of most primary cells or in the same solution as in secondary cells.
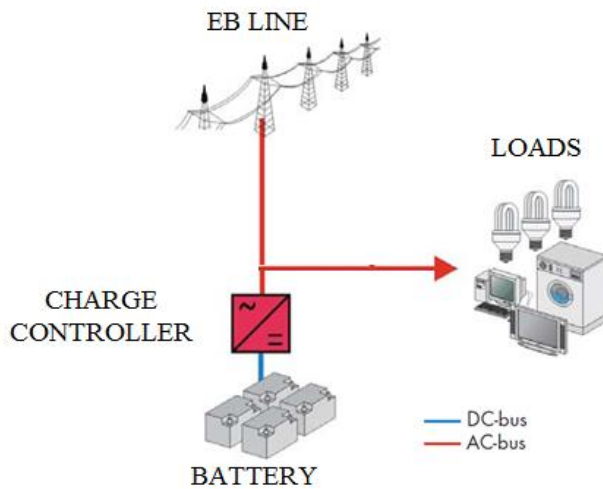

Fig. 5.1 Battery diagram

Fig. 5.2 Battery connection

5.2.2 SOLAR PANEL

✓ Solar panel refers to panel designed to absorb the sun's rays as a source of energy for generating electricity or heating. A photovoltaic (PV) module is apackaged, connect assembly of typically 6 x 10 photovoltaic solar cells.

✓ Each module is rated by its DC output power under standard test conditions (STC) and typically ranges from 100 to 365 watts. A single solar module can produce only a limited amount of power, most installations contain multiple modules.

✓ Modules electrical connections are made in series to achieve a desired output voltage and/or in parallel to provide a desired current capability.

✓ Solar power systems very widely in their power producing capacities, and the cost of implementation is directly proportional to that capacity.

✓ Solar energy is not cheap.In fast,one could argue that from a cost savings point of view it is not very practical at all because it typically will take many years to reach the break even point when considering the cost of your local utility electricity.

✓ However, despite the cost of solar power systems,for many folks it is a worthwhile investment for reasons other than saving money on your utility bill.

✓ If your property is far from the nearest road, it may actually cost less to have solar power than to pay to run electricity to your property.

✓ If you have an RV, or boat, solar power is a great way to have electricity present.

CHAPTER 7

RESULTS AND DISCUSSIONS

7.1 RESULT

This is an ongoing project. Our prime objective is to assist agricultural people. This paper gives basic idea of design implemented a portable ploughing tool using a renewable energy source(solar energy).So overall implementation cost is very cheap and it reduces the time consumption and labor for crop cultivation. Looking at the current scenario we have chosen android platform, so that most of the farmers can get benefit.

7.2 DISCUSSION

In this project the design consist of android phone with remote control by the use of Bluetooth. Farmers can interact with

the android phoneand sends the control signal by the Bluetooth module which in turn will control other embedded devices/sensors. So that we have discussed a simple system by use of Bluetooth in this paper but in future it can be expanded to many other areas.

CHAPTER 8

CONCLUSION AND FUTURE SCOPE

8.1 CONCLUSION

In conclusion, this low cost system is designed to improve the standard living in agricultural field. The remote control function by microcontroller provides help to farmers. The chassis handles the complete weight of solar panel, battery and the hardware mounted on agribot which is able to perform each and every operations skillfully and successfully. Moreover, implementations of contactless (wireless) Bluetooth connection in control board allows the system installation in more simple way.

8.2 FUTURE SCOPE

Useful suggestion based on survey in this research to develop this application in the future such as

✓ Give additional features to the remote control.
✓ Provide additional features such as implemented in GSM.

✓ Develop the new user interface to make it more interesting and also more attractiveto users.

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