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Smart Automatic Wheat Cutter using Raspberry pi

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ABSTRACT: In this paper, the main purpose of our Project is to help small scale farmers who having land area less than 5 acres by designing small scale harvester machine to harvest grains very efficiently. Our project work will focus on ease of harvesting operation to the small scale farmers for harvesting wheat in less time and at low cost by considering different factors such as cost of equipment, ease of operation and time of operation. This machine has cutting blades which cut crops in scissoring type of operation can cut up to two rows of crops. The power unit for this machine is battery supply of 12 volts. This power is transmitted through gear box, sprocket-chain mechanism to the cutter blades and other.

I.INTRODUCTION

This project deals with the development and design of a wheat cutting machine, available evidence suggests that the mode of cutting and sorting wheat in the rural areas in developing countries is by traditional use of hand beating of the paddy or using animals. This method is time consuming, energy sapping and often it breaks the grains. The developed and designed wheat cutting & sorting machine has ability to sort the wheat crop from wastage part, which are often lighter in weight.

Thus, this will leave aside the massy wheat from being collected. It is also capable of reducing time wastage, reduction in breakage of the grains and separation of the stalk from the grains. In addition, it is clear that, from the design calculation, the total manpower required to comb off the grains from stalk is only two people.

II.LITERATURE SURVEY

Raut et. al [1] proposed on Design Development and Fabrication of a Compact Harvester. This machine targets the small scale farmers who have land area of less than 2 acres. This machine is compact and cut a two rows of soybean plants. It has cutting blades which cut the crop in a scissoring type of motion. A collecting mechanism is provided for the collection of crops to one side of the cutting. This mechanism is also powered by pulley arrangement. This compact harvester is manufactured using locally available spare parts and thus it is easily maintainable. After testing this machine in farm it is found that the cost of harvesting using this harvester is considerably less as compare to manual harvesting.

Mekonen [2] represented project on Design and Development of manually pedal operated grain thresher machine. Thresher machine is one of the agricultural machines that are used to separate harvested grain from the stalk by heating stalk with rotary drum that have blade on it. The machine has no. of different components and this component are faced to different type of loads and forces. From the design and application of this manually operated grain thresher we can understood that using of the human labour will minimize the human labour loss and animal labours that is using after them.

Boyle et.al [3] proposed a technique on designing a small scale grain harvester. This project is intended to help small scale grain growers meet an increased demand for diverse, a locally grown grains by designing a reaper binder machine. To refine prototype and design they work closely with a three person review panel, made of grain farmers and industrial designers.

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Arvind et.al [4] investigated a technique on Design and Development of mini paddy harvester.
Small scale farmers frequently face the problem of labour shortage or are unable to afford the wages to be paid. This problem prevents the fiscal growth of farmers and ultimately hammers the development of their farm land and family. This project is focused developed mini paddy harvester can harvest up to two rows of paddy at a time. This newly design paddy harvester will ultimately reduce the cost of hardware.

III.BOARD HARDWARE FEATURES

A.POWER SUPPLY

Battery is used for store the energy and provides the supply to all circuitry. The battery should requires following properties,
(1)Long Life
(2) High reliability
(3) Low cost
(4) High overall efficiency

Figure.1 Power Supply

B.CAMERA

A webcam is a video camera that feeds or streams an image or video in real time to or through a computer to a computer network, such as the Internet. Webcams are typically small cameras that sit on a desk, attach to a user's monitor, or are built into the hardware. Webcams can be used during a video chat session involving two or more people, with conversations that include live audio and video.
The webcam may also be used in its original sense of a video camera connected to the Web continuously for an indefinite time, rather than for a particular session, generally supplying a view for anyone who visits its web page over the Internet.

Figure.2 Web Camera

C.Raspberry pi-3

It small capture cord to do motors height of the wheat crop and gives according instruction to the wheat cutter to adjust height, position and cutting mechanism.
Raspberry pi is a cheap computer that runs Linux, but it also provides a set of GPIO (General Purpose Input-Output). Pins that allow you to control electronic components for a physical computing and explore the internet of things (IOT).

Figure.3 Raspberry pi-3

D.Base Movement Motor

In our project we used three motors for movement mechanism purpose, so Base Movement Motor has 100rpm, 12V DC geared motors for robotics applications.
It gives a massive torque of 27Kgcm.The motor comes with metal gear box.
Johnson base movement motor starting current approximately 400M x4.

E.Vertical Movement of Machine Motor-

Second motor we have to use for the vertical movement mechanism of motor.
It has specification of 12V DC, 30rpm for movement.
It is specially used for the industrial purposes. In that vertical motor the current depends on required torque.
For 4Kgcm torque 1.5 current is required, x1.

F.Cutter Motor-

Third motor is used for the cutting purpose of our wheat crop is cutter motor. Cutter motor is very important and useful motor for us.
The main function of our project is cutting the wheat crop automatically while manually.
The specification of cutter motor is that 12VDC, 1440+ rpm and it is mostly used for the industrial applications.
While performing the action maximum current required for cutting the grass or crop is 1A x2.

G.Base Mechanism

It has minimum 20 gauge ms metal sheet made of size approximately is 1.5^1*1.5^1.
It has sliding mechanism assembly material of ms angle is 35*35*2 mm.

H.Slide Mechanism (Height Adjust)

The most important function in our project is that, to adjust the height.
This function is done by the using the sliding mechanism motor. For adjustment of height geared type helical grew or say rack and pinion type mechanism which is made of the cast iron type.
This is used for the sliding purpose in Wheat cutter mechanism.

IV.BLOCK DIAGRAM

A.WORKING

The power supply is source of hardware and raspberry pi software/controller it starts moving forward along the model track.

1) Firstly we need to initialize the raspberry-pi3 as controller for programming purpose. As per instruction, mechanical assembly (hardware) will be operated.

2) Wheat crop images captured through camera. Camera is also used to recognize the colour of wheat grain. Camera provides images to raspberry-pi as input.

3) After captured the wheat crop through camera. We can decide whether the grains are matured or not. Here, we use image processing for deciding height and colour of wheat crop.

4) If grains are ready for cutting then we need to adjust the height of cutter blade. We used DC motor drive is used to move cutter. It moves cutter as per the height of wheat plant and detects grain on the wheat crop.

5) After adjusting the height of cutter and positioning of cutter, we start the cutter motor and move robot forward for working. After completion of all wheat the robot will stop his working.

BLOCK DIAGRAM:

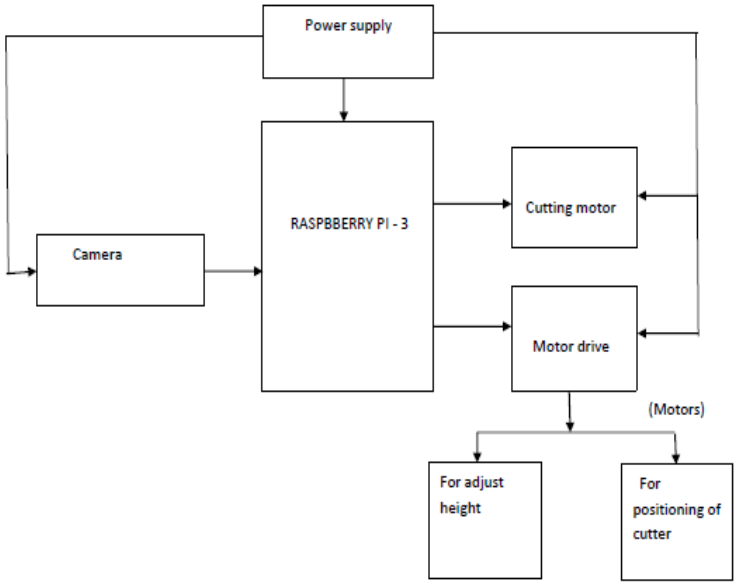

Figure.4. Block Diagram

FLOWCHART:

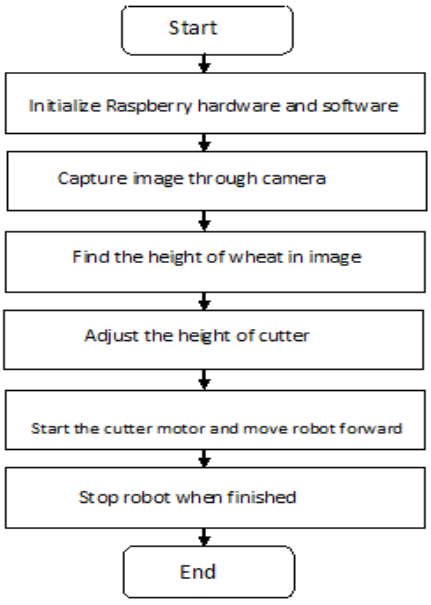

Figure.5 Flow Chart

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DETECTED HEIGHTS ON THE SOFTWARE:

Figure.6 Detected Height

Figure.7 Detected Height

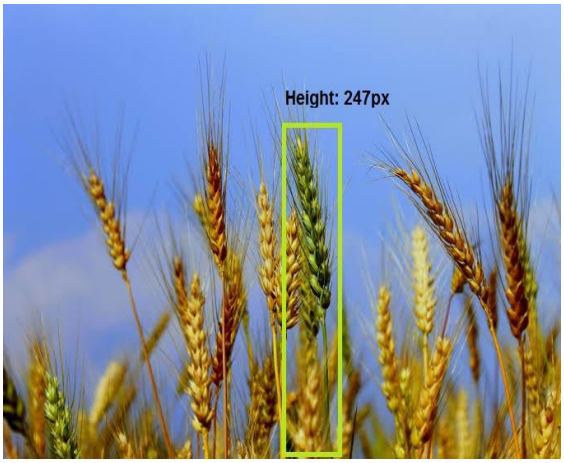

Figure.8 Detected Height

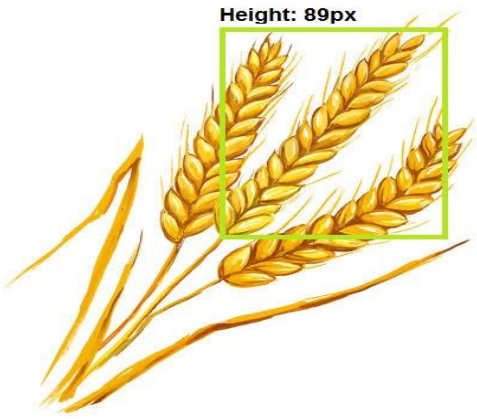

Figure.9 Detected Height

V.CONCLUSION

In this paper, we have represented a smart automatic wheat cutter by using Raspberry-pi3. A system, which is a new type of mechanism is fabricated which is different from other cutting mechanism. By literature and field observations we except that our design will minimize manual work, cost and time. It can be concluded that this machine is comparatively compact and easy to handle. The most important feature is required for a wheat crop is cutter; we designed the cutter by considering strength, physical properties and other factors of crops. The harvesters available in market are suitable for large farms, so this can be best machine for farmers with small land. The success of this machine is depends on how farmers receives the machine.

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