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Precision farming using embedded systems and machine learning

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ABSTRACT

Agriculture plays one of the major roles in occupation of India and machine learning is a growing field in agricultural analysis. Choosing a particular crop is extremely important issue during agriculture. Any farmer is curious about getting recommendation of the crop he should grow. The common problem existing among Indian farmers are they don't choose right crop supported their soil requirements. Because of this they face big setback in productivity and leads to loss in income. Also monitoring weather is a crucial part for precision agriculture. A farmer can't fight with weather. However, he can accept the given situation and take additional farm management practices to attenuate crop losses and take precautions beforehand. Therefore, accurate information regarding weather is vital in order that farm activities are often planned without adverse events. Being conscious of real time weather is best thanks to protect crops and secure high and healthy yield. In this paper, this problem is solved by proposing a crop recommendation system using Machine learning algorithm and getting real time data of weather using wireless sensors in one system will be really beneficial for the farmers.

Keywords— *Agriculture, Crop Recommendation, Machine learning, Wireless sensors, Real time meteorology, Embedded systems*

1. INTRODUCTION

From Long ago agriculture is taken into account because the foremost culture practised in India. People use to cultivate the crops in their own land for their needs and it becomes the basic need of the individual. From the design of latest innovative technologies and techniques within the agriculture field is slowly degrading. Thanks to these, abundant invention people are cultivating artificial products which results in an unhealthy life style and causes various diseases farmers are some times forced to inject harmful substances for better yield in the farm. In current generation modern people lack awareness about the cultivation of crops in a right time and right place due to these cultivating techniques the seasonal climate also are being changed against the elemental assets like soil, water and air which led to insecurity of food. Due pollution weather is not stable now and there can be an abrupt change in weather anytime and anywhere.

The machine learning grasps the different algorithms supported. There are several different types of learning such as supervised and unsupervised and reinforcement learning each has importance and its own limitations. Supervised learning algorithm builds a mathematical model from a group of knowledge that consists of both inputs as well as desired outputs. In Unsupervised learning algorithm builds a mathematical model from incomplete data which contains only inputs and no desired output labels. This is one of the useful ways of agriculture and is globally accepted using machine learning and embedded system technologies separately for agriculture.

This paper aims to recommend crop using Machine learning to the farmers and have real time data of weather using wireless sensors for the aim of accurate farming. It merges both the advance technologies like machine learning and embedded system.

2. LITERATURE SURVEY

The paper [1] aims to maximise the yield of the farmers by crop recommendation using machine learning techniques. Ensemble technique is employed for crop prediction. Ensemble may be a technique which is additionally referred to as model combiners combine the facility of two or more models to achieve better prediction, efficiency than any of its models could achieve. To be précised Ensemble technique referred to as Majority voting technique is employed. Learners model used were support for vector machine, naïve Bayes, multi-layer perceptron, random forest. Their main conclusion was to assist the farmers to extend in productivity of crop.

The paper [2] aims in analysing agriculture soils using data processing techniques. Discussed various data processing aspects such as data relationships, clusters, association, association, sequential patterns, decision tree, genetic algorithm, data visualisation also various data collection methods intimately. Also covered various sorts of soils for the analysis purpose and therefore the main natural factors which are influencing soil Stalinization and solidification. Scope of machine learning and data processing tools was discussed intimately.

The implementation proposed in paper [3] gets the essential temperature, humidity and few other parameters. it had been

developed using Node MCU. This uses a temperature humidity sensor and soil moisture sensor for monitoring weather with reference to agriculture. this is often done mainly to focus on under developed and developing economies and to urge precision in agriculture and help farmers. [4] They have developed an efficient real-time realization of a Gaussian mixture model (GMM) for execution on the NXP FRDM-K64F embedded sensor board. In this their integrated hardware /software enable real-time data analytics and continuous training and re-training of the machine learning (ML) algorithm. The real-time ML platform can accommodate several applications with lower sensor data traffic. In the [5] paper they have created an agriculture talk bot using machine learning and artificial intelligence to help the farmers.

3. PROPOSED SYSTEM

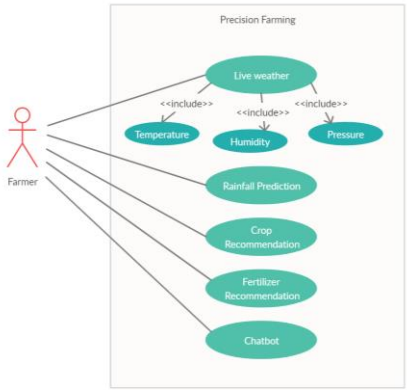

Fig. 1: Use case diagram

3.1 Dataset collection

The dataset containing the soil specific attributes which are available on the govt website. The attributes considered are depth, texture, Ph, soil, Colour, Drainage, Water holding and Erosion. The stated parameters of soil play a crucial role within the crops ability to get rid of water and nutrients from the soil. For crop growth to their possible soil must be provided acceptable environment for it. Soil is that the anchor of roots. The water holding capacity determines the crops ability to soak up nutrients and other nutrients that are become ions, which is that the form that the plant can use. Texture determines how porous the soil is and therefore the comfort of air and water movement which is important to stop the plants from becoming waterlogged. the extent of acidity or alkalinity (Ph) may be a master variable which affects the supply of soil nutrients. The activity of microorganisms presents within the soil and also the extent of exchangeable aluminium is often suffering from PH. The water holding and drainage determine the infiltration of roots. Hence for the subsequent reasons the above stated parameters are considered for selecting a crop.

3.2 Crop Prediction using Logistic regression

Methods involving regression are essential to any data analysis models which plan to describe the association between a response variable and any number of predictor variables. Situations involving discrete variables constantly arise. Logistic multivariate analysis extends the techniques of multiple correlation analysis to research and inquire situations during which the result is categorical, which is, taking over multiple values. This algorithm works with binary data, where either the event happens, represented by "1", or the event doesn't happen, represented by 0. So given some feature "X", it tries to seek out out whether some event "y" happens or not. So "y" can either be "0" or "1". . within the case where the event happens, "y" is given the worth "1". If the event doesn't happen, then "y" is given the worth of "0". for instance, if "y" represents whether a specific crop among an enormous sort of crops, then "y" are going to be "1" if the crop does grow or "y" are going to be "0" if it doesn't. this is often referred to as Binomial Logistic Regression. there's also another sort of Logistic Regression which uses multiple values for the variable "y". this type of Logistic Regression is understood as Multinomial Logistic Regression. The above example is taken from http://dspace.bracu.ac.bd/.

3.3 Weather monitoring using embedded systems

In this we've used various hardware components like,

3.3.1 ESP 8266: The ESP 8266 may be a low cost WIFI microchip with a full TCP/Ip stack and micro controller capability. This small module allows microcontrollers to attach to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands.

Fig. 1: ESP 8266
Source: Zerynth docs documentation

The ESP 8266 may be a low cost WIFI microchip with a full TCP/Ip stack and micro controller capability. This small module allows microcontrollers to attach to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands.

3.3.2 BMP 180 pressure sensor: Barometric pressure sensors measure absolutely the pressure of the air around them. This pressure varies with both the weather and altitude. counting on how you interpret the info, you'll monitor changes within the weather, measure altitude, or the other tasks that need an accurate pressure reading.

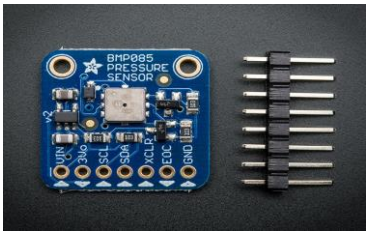

Fig. 2: BMP 180 pressure sensor
Source: addafruit

3.3.3 Connecting wires: Connecting wires provide a medium to an electrical current in order that they will travel from one point on a circuit to a different. within the case of computers, wires are embedded into circuit boards to hold pulses of electricity. Most wires in computers and electronic components are made from copper or aluminium, because copper is reasonable and electrically conductive.

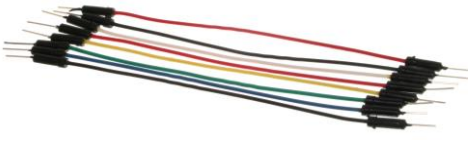

Fig. 3: Connecting wires
Source: Indiamart

3.3.4 DHT11: The DHT11 may be a basic, ultra-low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to live the encompassing air, and spits out a digital signal on the info pin (no analog input pins needed). Its fairly simple to use, but requires careful timing to grab data. the sole real downside of this sensor is you'll only get new data from it once every 2 seconds, so when using our library, sensor readings are often up to 2 seconds old.

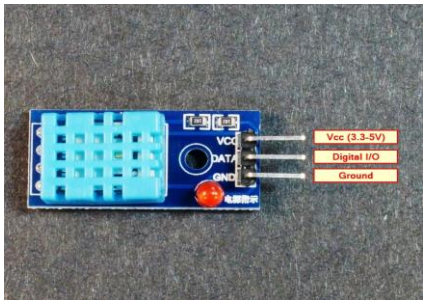

Fig. 4: dht11
Source: Protosupplies

3.4 Chatbot for local farmers

Many of our farmers may deal with certain questions like what percentage production might be grown in one hectare? Answers of this questions can be often given via already some predefined questions that farmer could ask. Whenever farmer asks a question chat bot will answer a question.

3.5 Integrating embedded system and machine learning

Our node MCU will collect the data of various parameters like temperature, humidity, pressure from their sensors. We will have firebase as our database. The data which is taken from node MCU that will be added in firebase. Our firebase will read the data and we will have the prediction.

4. FUTURE SCOPE

More parameters can be taken into consideration for weather monitoring system. Having a platform where farmers can consult to the expert in their field are often one among the longer-term implementations during this interface. Automatic irrigation control can also be implemented using moisture sensor to fetch data regarding water presence in the farm and do turn on or turn off water pump accordingly. Trespassing can be monitored developed using surveillance system using infrared sensors and pressure sensors.

5. CONCLUSION

Our system would help the farmers to increase the productivity of agriculture. It will reduce the use of chemicals in the production of crops. By deploying sensor devices in the environment, we can bring the environment into real life i.e. it can interact with other objects through the network. The system will basically be able fulfil the farmers need and will be more précised in the farming.

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7. REFERENCES

[1] Rohit Kumar and Mitalee Pendke"Crop recommendation system to maximise yield "
[2] Ferdin Joe John Joseph"IOT based weather monitoring system"
[3] Ramesh Babu and Rajesh Reddy"An analysis of soils by using data mining techniques"
[4] Jongmin Lee; Michael Stanley; Andreas Spanias; Cihan Tepedelenlioglu "Integrating machine learning in embedded sensor systems for Internet of things applications"
[5] J Vijay laxmi,K PandiMeena "Agriculture talkbot using AI"

