

Smart Pest Recognition System for Sri Lankan Crop-Growing

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Abstract: Srilanka is a developing country. Agriculture is main livelihood in sri lanka. Paddy cultivation is the major crop production among it. main problem in Paddy cultivation is pest defect. In Every month any pest defect may occur annually in Paddy cultivation. Therefore, sustainable cultivation concept is needed to compete with the modern world. Not only insect hazards, not only insects hazards but floods and rats also can damage the paddy field. There are many damages to paddy cultivation. Paddy farming uses a variety of chemical remedies to prevent insect damage and hazards. This results in loss of yield and a reduction in yield. The answer to this question is how to teach insect destruction by local chem methods. Details of unknown insects are readily available.

Another major problem for farmers is the lack of identification of insects as farming is concerned. Farmers have no idea about the threats or hazards happen to the crops by the insects currently it is a big issue facing the society. Due to the delay in getting the information about it. Because of the ignorance of the traditional medicines needed for these insects. For all these reasons, farmers are able to make choices easily.

This will help the farmer to identify the pest infestations that come to the farm and destroy the insects with the conventional methods of chemistry and other medicines needed to prevent them. Educates the farmer on how to make cam methods and how to use other medicines.

A demonstration system will be developed to address the reasons discussed above. Also, research is being conducted using the proposed system to evaluate and compare existing systems. It can provide the farmer with the most reliable, efficient, smart and convenient services

Keywords: Paddy cultivation, sustainable cultivation, insect hazards

Introduction

Farming is one of the major processes that provide food for people. Farming happens throughout the whole world in different stages and different crops. When it comes to Sri Lanka paddy cultivation is the main crop. Among the cultivated paddy lands 64% of which is cultivated during the dry season and during the wet season 35% of paddy lands are cultivated. In Sri Lanka, nearly 879,000 farmer families are employed in rice cultivation. Among 20% of the country's population is engaged in paddy cultivation and 32% of the employment depends on paddy cultivation. Rice is the main meal among the whole people in Sri Lanka. Sri Lanka's agriculture mainly depends on the paddy cultivation. Rice production majorly depends on rainfall and the government supply essentials of water via irrigation tunnel or channels during the farming seasons. Also, some areas only use rainwater for the cultivation. There are two rice cultivation seasons in Sri Lanka which are known as "Maha" from October to March and "Yala" from April to September. Throughout Maha season, there is enough water to maintain the farming of all rice fields.

However, in the Yala season, there is not adequate water to cultivate all rice fields. Only half of the paddy land can be cultivated in the Yala season. Farmers, who are directly involved with paddy cultivation in Sri Lanka is facing a lot of problems. Several problems were revealed in paddy cultivation in Sri Lanka and most of them are still unsolved or doing manually. Those problems can be Agricultural, Biological, Transportation or Financial. When narrow down these things most people don't know what type of pest is good or bad for paddy type. Even though they selected proper pesticide insect, they don't know how to protect their cultivation from pest. There are several difficulties with using fertilizer and pesticides. Some people know the fertilizer dosage to use but their Paddy plants don't show the maximum growth rate. Though the cultivation is in 100% good condition people can't realize how much of rice harvest they will get. To find out solutions for these problems they will always have to run to agricultural specialists. But sometimes they won't get the most suitable answer because agricultural specialists are people and they make mistakes. When farmers are cultivating paddy, pesticide insects are common issues they face. These diseases can be insect/pest attacks, fertilizer deficiencies, and virus attacks or fungi disease. And when it comes to various paddy types, there will be different types of pesticide insect sets that are unique on paddy types. When farmers are continuously using pesticides to avoid these pesticides insects, pest vectors will adapt to pesticides. Therefore, farmers should have efficient, effective and reliable resources to eliminate these diseases. To eliminate diseases identifying the exact disease is the most important.

The Agro products are the important natural resources available to the people of Sri Lanka. Lots of people depend on land or Agro products to earn money. Sri Lanka is an

agricultural country which is mainly focused on rice cultivation. Paddy cultivation friendly insects play a major role in rice production. Paddy cultivation friendly insect supplies nutrition to the plants. Rice production rates have declined over the years due to improper insect breeding. Therefore, farmers must manage their paddy field properly to enhance and to get better productivity. Without proper knowledge of pesticide insects, farmers may not achieve maximum production. To avoid the above-mentioned circumstances the pesticide insect analysis function is introduced. Pesticide insect analysis function identifies insect type, insect texture of paddy in the paddy field by analyzing insect images. Finally, the elimination of pesticides and conventional methods of farming for them. They can also contact the Department of Agriculture as soon as possible.

The most common problem in Sri Lanka is finding out which insect pests are coming to the paddy field. This results in lesser growth of paddy plants. Growth analysis part of the system designed to maximize the farmer's productivity by identifying the growth problems of the rice plant in every growth stage. The system will provide farmers the ability to identify the growth rate of a rice plant in their paddy field by taking sample images. Which would otherwise have been performed by an agricultural expert? It's time-consuming and spends a lot of money because an expert may have to come much time and analyze the plant growth in different growth stages. By maximizing the farmer's work efficiency and production, the system will perform the farmer's requirements while remaining easy to understand and use.

Currently, there are no techniques to calculate or forecast rice harvest amount in Sri Lanka. So, it has been led to many problems. Farmers cannot get an idea of the extent of the harvest due to the pest in this

season. This will help the farmers to avoid pests and improve their productivity of the crop by educating the farmers on the use of traditional methods. When considering the current situation of the country, the society and daily life of farmers show that majority of the farmers in the society cannot fulfill their human needs. Because Farmers are unable to get their crops well. It is impossible to get the desired harvest. So, the farmers face a lot of problems for their needs and way of selling the harvest. Therefore, the farmers need to sell their harvest at any cost and need to abstain from the debts as soon as possible. Also, the farmers must sell the best amount of their production to the debtors and they need to debt again for their day to day life and usage of the family. Moreover, farmers will face a lack of money problems to buy fertilizers for next season. By knowing that harvest they can get debt according to their calculated harvest amount.

Nowadays, everyone has a mobile phone. Everywhere you go, we can see people use various types of mobile phones. Mobile phones have completely changed the human lifecycle. We can call, send text messages, read emails and play games by using this small device. Not only that mobile phones can be used to identify several types of agricultural issues because it is a convenient way to interact with users more easily. Most people have at least a simple, if not sophisticated, mobile phone. These devices are convenient to carry around and you can use them on the go as long as there is network coverage wherever you are.

Image processing is viewed as arbitrarily manipulating an image to achieve an aesthetic standard or to support a preferred reality. However, Image processing is more meaningfully described as the improvement of pictorial information for human perception. Rather than, enhance the pictorial information and extract image details helps to identify several pictorial

information which human can't see in their eyes. In this case, image processing is actively participated to do identification of pictorial information. Also, image processing can be used in a manner consistent with the scientific method so that others may reproduce and validate one's results. This includes recording and reporting processing actions and applying similar treatments to adequate control images. identify the problems of insects in paddy farming the research using image processing techniques(Azfar et al., 2018).

Data mining is a very important part that can analyze an enormous set of data and get hidden knowledge and useful data from large amounts of data. Data mining can be applied effectively to forecast or predict some valuable data via analyzing past data. The traditional ken method prediction part is used in data mining techniques to predict.

Literature Review

Nowadays technology has made life easier and quicker. The modern world is developing many new things. One of the technologies is mobile phones. Mobile phones have vastly changed human life cycle. In Sri Lanka one person has more mobile phones. But people don't use new technologies to get better economic productivity.

Farming is the main occupation in Sri Lanka. Today most of the people involve with rice production and catch crops production. Every farmer has mobile phones, but they use that phone only for communication purposes. Sri Lanka does not have any android mobile application to analyze insect identification, know about traditional kem method. Either there are not any desktop applications to identification pesticide insects. Farmers cultivate do not know which fertilizer type to use in order to improve the harvest(Ravisankar et al., n.d.; Zhong et al., 2018).

The identification and classification of insects are major technical and economic importance in the agricultural industry. There are several types of researchers to identify pest insects using image processing done inside Sri Lanka and abroad. Most of these researches have been done based on paddy fields and agricultural research institutes. Those researches are not made for the use of normal people. That means farmers cannot understand them and can't use it. In addition, to do these projects special equipment, laboratories, special condition, and field expertise are needed. Results of these researches will be used by agriculture professionals, and farmers always will have to run to them to get this knowledge (Jankielsohn, 2018).

There are many forms of work conducted locally with regards to pest insects utilizing computer systems. Most are performed in the areas of image recognition and analysis, data mining and artificial intelligence. But when it comes to usability, farmers can't use it. Those researches haven't deployed as a product to use for the people who are involved with farming. That means they are complex computer algorithms and farmers don't have the knowledge about how to work with them.

To order to combat some of the pest insects, new rice varieties are periodically published by agricultural research institutes. Therefore, if the research is old, it is not valid. Then we must invent new researches or update current systems. In Sri Lanka, there is no ongoing rice disease analysis system deployed yet. Therefore, old researches are not much valid when time passes.

When it comes to our work, it is focused on principles of machine intelligence, photo recognition, and processing. And this system is a distributed application. The client is an Android mobile device. Most of the people in Sri Lanka, including farmers have mobile phones which can run Android application.

So, our system can easily be deployed into their mobile devices. There is no hard process to follow, farmers just have to upload their pest insect affected into the mobile application and then the client application will send images into the server and inside the server, images will be processed and the result will be sent to the client. Farmers will then quickly work out if the bug they are struggling with is a pest. The front end of the company does not include complicated items. Everyone will use the device without even learning how to program computers (Lou et al., 2013).

To analyze the growth of the pest insect, there are several types of research. But those researches are mainly based on one or two parameters such as height, insect size, insect's edge, color. In Sri Lanka, we don't have any system like this to identify pest problems. Not only in overseas countries, they did some work utilizing image manipulation methods, but these studies study on laboratory bases and they did it for a plant in unique conditions. In Sri Lanka, only work is performed by taking measurements manually and evaluating them for an insect community. Those researches are done for the purpose of identifying which insect is good for the specific area. Farmers don't have any involvement with those researches and all the things are done before paddy seeds come to farmers. In real-life circumstances, such researches were not added. They used such parameters just to calculate development in their laboratory conditions. Using more than two parameters to quantify different stages of development. The ultimate judgment on the growth of pest insects is focused on two criteria. That means the output result will be more accurate than other researches. In Sri Lanka, there is no system to identify paddy pest insects and tell how much use to traditional kem method. Farmers must do this by going to identify the insect and check the size and color which has given by

agriculture experts. Farmers must do this by going to insects in the plant and check the insects which have given by agriculture experts (Edirisinghe and Bambaradeniya, 2006; Oman, 1968; Yamamura et al., 2006).

pest insect prediction was already done by previous researchers, but they predict only for the current season. And some researchers have done it to count only the whole pest in a certain area. They did not predict the most suitable traditional kem method variety for the pest insects of the area, the most suitable irrigation system and future rice production per one acre. In this research, we forecast the most suitable traditional kem method variety for the pest type of the area, a pest for their individual paddy lands for up-coming paddy seasons for three years (Azfar et al., 2018).

Each country needs an efficient system of food production and distribution to provide the people with food security and to achieve economic development. Agriculture forms a significant part of the effort to produce food in a region. Several factors influence farm production from pre-harvest to post-harvest periods. This covers factors such as overproduction, underproduction, attacks on pests and diseases, and volatility in consumer prices. A more in depth research These problems indicated that the root cause was that farmers and other agricultural stakeholders were not providing the appropriate information at the right time when they most needed it. (Heeb et al., 2019) Both need published information such as crop varieties, fertilizers, correct soil types and complex real-time information such as current crop production rates, market prices, and outbreaks of pests and diseases. Smart Computing provides an creative way of producing situational information by presenting published awareness as actionable information, and by having users act on this information. In this, we expand our previous research by re-conceptualizing based on information flow in Global

Positioning Systems (GPS) to provide timely, actionable information through crop calendar functionality (Chandrasiri and Ekanayaka, n.d.; Ginige and Richards, 2013). We have implemented empowerment theory to establish empowerment-oriented farming processes to inspire farmers to produce crowd sensed information and integrate it to generate new situational awareness about outbreaks of pests and diseases. It provided a holistic model of information flow for the agricultural domain such as energy flow in biological environments enabling us to create a digital knowledge ecosystem for agribusiness. This device is now undergoing trials among thousands of farmers in Sri Lanka and India (Nishantha et al., 2016; Western Sydney University, Australia et al., 2019; Yang et al., 2005).

Implementation

A. Proposed system design Diagram

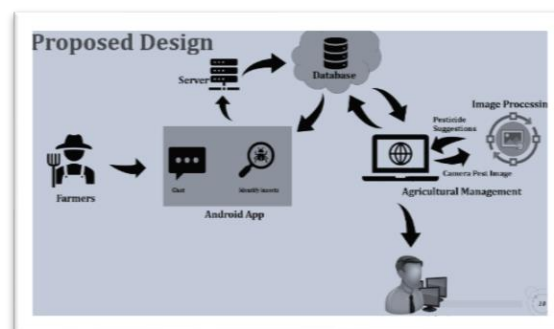


Figure 34 Proposed system design

Nowadays technology has made life easier and quicker. The modern world is developing many new things. One of the technologies is mobile phones. Mobile phones have vastly changed the human life cycle. In Sri Lanka, one person has more mobile phones. But people do not use new technologies to get better economic productivity.

Farmers face a lot of problems because of this problem, so using this technology, this project proposes an answer to this problem. Unidentified insects that come into cultivation are identified using image processing technology. Insect identification

is done using a data set from the insect. Identifies the insect and proposes the traditional medicine for the insect. Farmers can discuss issues with agriculture via SMS. The Department of Agriculture could record the details of each insect. Users can create their own account using the system One person in agriculture gives access to this system. He can remove and update the traditional insect-related additives. Implement most useful smarter, easier, and efficient System detect unknown insects and use traditional chem methods for insects.

My main intention has is to find a solution to the problems. Which is upcoming in the field of agriculture's order to succeed in my intention, I would collect reliable and quantitative data order to find a solution my proposed methods are

- Mobile App
- Realtime Database
- Web Development

In order to get information from this app to solve these upcoming problems, If the framer arises a problem related to pesticides.so he is eagle finding assistance to post control if the farmer has an out who is cannot be identified so then the system could be tracked. The pest using the motion tracking system.so they could obtain information from system motion tracking.



Figure 35 Home screen of the application



Figure 36 The correct insect appears

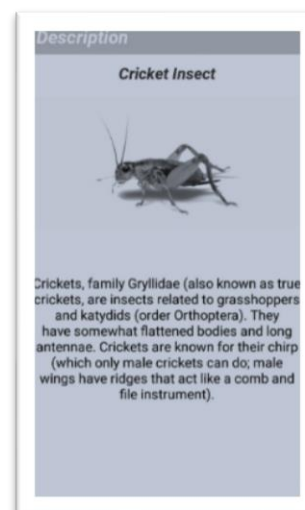


Figure 37 This interface shows the traditional kem methods of suitable of that pest and how to make them.

Conclusion

The purpose of this research project is to provide efficient and effective service to farmers and agriculture-related people. Before we start this research project the major problem which farmers having was there was not an automated system that can be used by themselves. major problematic parts such as using many pesticides without knowing the exact limit to use and not knowing the exact pest. could not identify the cultivation is in proper growth and unable to predict next season's harvest. Came up with

a solution to these major problems regarding Sri Lanka's main cultivation, paddy.

Sinhala is the only language currently supported in this mobile application. Apart from Sinhala, this mobile application can be introduced to other languages such as Tamil and English. In the future development of the mobile application, wishes to add the Tamil and English language to handle this app. From time to time we must change the requirements of this application because the agriculture sector is rapidly changed every day. Finally, this mobile app achieves its objectives of "Connecting farmers to I-era." Since this mobile application is based on Android, in the future this can be developed to run on multiple platforms with the same content and functionality.

But with the improvements in the technology there are so many enhancements which can be integrated into the solution which few of them are explained below.

- Online delivery to Kem methods through the app.
- Awareness of all types of diseases affecting agriculture and other crops.
- Push Notifications via SMS to participants.

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