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SCUOLA DI INGEGNERIA INDUSTRIALE
E DELL'INFORMAZIONE

DREAM - Data-dRiven PrEdictive FArMing in Telengana

RASD
Software Engineering 2

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Contents

1 | INTRODUCTION

1.1. Purpose

The Indian's population counts 1,8 bilions people and their main source of incomes come from the agriculture sector. More precisely 80% of farmers own less than 2 hectares of cultivable land. Nowadays, as a consequence, an important part of the population is already below the poverty threshold, and if nothing will be changed during the next decades this condition will become even worst.

In addiction to this, the productivity will decrease due to many factors: for example the increasing demand of food caused by the growth of the population and the aggravation of climate conditions as a consequence of irresponsible behaviour towards the environment.

An improvement in the communication and data management system could potentially avoid and prevent production problems and lack of food for the poorer part of the population.

Our main goal is to help both farmer and Talengana's policy makers to improve their communication with the focus in quality and quantity of information. The farmer need to receive more technical and environmental advice in order to develop their working skills and consequently their productions. On the other hand policy makers should have available enough data and feedback about farmer's performances in order to improve their economical policies and the country general welfare.

1.2. Scope

In order to manage more efficiently the communications between farmers and policy makers our DREAM application will provide an easy way to access the system which will make available to all different users a dedicate set of tools and information.

Farmers will be able to monitor weather conditions, crops and fertilized suggestions. They will have the possibility to send direct requests to expert or other farmers in order

to receive advice. The ease of communicating their production data and problems will be a key point.

Telengana's policy makers will be able to monitor farmers performances and decide if current policies are providing good results. They will also be supported in the visualization of critical situations in order to intervene in advance.

1.2.1. World phenomena

World phenomena	Description
WP01	Weather changes
WP02	A rare climatic event occours
WP03	Farmer cultivates his land
WP04	Farmer harvests
WP05	A new law concerning agriculture is published

Table 1.1: Table of World phenomena

1.2.2. Shared phenomena

Shared Phenomena	Description	Control
SP1	The farmer check the weather map of the area where he belongs	world controlled
SP2	The farmer receives a notification about an important climatic event	machine controlled
SP3	The farmer sends an help request	world controlled
SP4	The farmer gets an answer to a ticket he sent	machine controlled
SP5	The farmer reads information in the archive of the software	world controlled
SP6	The farmer writes in the forum	world controlled
SP7	The farmer is notified of new replies of a forum's thread	machine controlled
SP4	The farmer reads comments in a forum's thread	world controlled
SP4	The farmer is able to send a report about his production	world controlled
SP4	The farmer is notified of the policy maker answer about his production	machine controlled
SP4	The farmer is able to read the policy maker report about his production	world controlled
SP4	The policy maker is able to analyze the weather map of his working area	world controlled
SP4	The policy maker gets notifications about the main climatic events	machine controlled
SP4	The policy maker is able to read the news about the main climatic events	world controlled
SP4	The policy maker is able to watch and analyze the statistics	world controlled
SP4	The policy maker is able to access to the contact list	world controlled
SP4	The policy maker receives notifications concerning new tickets addressed to him	machine controlled
SP4	The policy maker is able to answer to the tickets	world controlled
SP4	The policy maker gets a notification about a farmer's report	machine controlled

1.2.3. Goals

Goals	Description
G01	Allow farmers to easily check weather condition
G02	Allow farmer to get in touch with experts
G03	Allow farmer to ask for economical help to the government
G04	Allow government organs to obtain a specific and general view among the conditions of agriculture
G05	Allow the government to improve the analysis and the sharing of important data concerning agriculture

Table 1.3: Table of Goals

1.3. Definitions, Acronyms, Abbreviations

1.4. Revision history

1.5. Reference Documents

- Specification document: Assignment RDD A.Y. 2021-2022
- Course slides

1.6. Document Structure

1.6.1. Section 1

Introduction about the purpose and scope of the system. Discussion of the main world and shared phenomena concerning our application's domain and goals are pointed out. Furthermore we sum up all the definitions and references in order to have a better comprehension of the following chapters.

1.6.2. Section 2

1.6.3. Section 3

1.6.4. Section 4

1.6.5. Section 5

1.6.6. Section 6

2 | OVERALL DESCRIPTION

2.1. Product perspective

2.1.1. Scenarios

Registration Yamir is a farmer in the province of Hyderabad and he saw in the newspaper the new project DREAM proposed by the government to help the agriculture's economy of the country. So he decided to register at the program. After he opens the app the system asks him to insert various information about his personal and fiscal status, his farmlands and how many collaborators he has. Yamir fills all the text boxes and clicks confirm. Then he is asked for the final confirmation through the mail. He sees an email from DREAM and after opening it he can click the link to conclude the registration. The system shows to Yamir that the registration has been completed.

Checking the weather Anirudh is a farmer who lives in the outskirt of Warangal, he has bought a new piece of land where he would plant a new sort of vegetable. In order to check if this is the right time to plant the seeds he needs to know as soon as possible if there will be a week full of rain or there will be a sunny period in the next weeks. For this purpose Anirudh uses the application DREAM to check the weather conditions in the next period, it allows the farmer to check lot of data suck as the humidity in the air , the amount of water that will fall down and the most important one which is the probability of rain in a certain day in order understand if this is the right time plant a new type of plant or not , because the rain water is vital for the beginning of the lifecycle of a plant.

Looking for plants information Shyla have planned a visit to the city market for tomorrow in order to buy some new plants and seed for her land. She has already some ideas about the plant he wanna cultivate, but she would like know something more. Since she is already registered to the DREAM platform he log in and navigates to the archive area. She search for "Apple Gourd" in the archive and open its technical sheet. Shyla sees that "Apple Gourd" is a really nice plant for the humidity and type of soils of his

land. Shyla is now more informed and sure of her choice.

Sending a ticket Ravi has a problem inside a piece of his lands because during the monsoons season the river has overflowed and flooded a good amount of fields . This particular part of his territory is very fruitful , he's always able to obtain a really good amount of products from it but this year he doesn't know how to get out from this terrible situation. In addiction to this , he is not sure if he will be able to pay the providers without the incomes produced by this piece of land. Ravi try to resolve this situation by sending a ticket thanks to the dedicated part in the DREAM application. In this help request he writes about his problem and in few days an expert in this answered to him by explaining a possible solution to balance the income by using the other fields he owns and to recover the piece of land which is under the water.

Checking for news

Filling a report

Replying to a thread in the forum

Receiving response of economical help

Looking for statistics

Replying to tickets

Organize an inspection Akanksha is one of the policy makers of Siddipet and his scheduling his next inspection week. In order to fix all the appointments he needs to call Dayanand and Kamalkant, two big farm owner. After he has logged in the DREAM application he navigate to the contacts list. Here he can insert the names and click the search buttons. Two contacts are now showed in the list and he can click on each one to see more information. After clicking on Kamalkant he see his phone number and he is ready to call.

2.2. Product functions

2.3. User characteristics

2.4. Assumptions, dependencies and constraints

3 | SPECIFIC REQUIREMENTS

3.1. External Interface Requirements

3.1.1. User Interfaces

3.1.2. Hardware Interfaces

3.1.3. Software Interfaces

3.1.4. Communication Interfaces

3.2. Functional Requirements

3.3. Performance Requirements

3.4. Design Constraints

3.4.1. Standards compliance

3.4.2. Hardware limitations

3.4.3. Any other constraint

3.5. Software System Attributes

3.5.1. Reliability

3.5.2. Availability

3.5.3. Security

3.5.4. Maintainability

3.5.5. Portability

4 | Formal analysis using Alloy

5 | EFFORT SPENT

6 | REFERENCES