



Bilkent University
Department of Computer Engineering

Senior Design Project

Project short-name: So FarM So Good

Project Specifications Report

Giray Baha Kezer, Fazilet Simge Er, Melih Ünsal, Kaan Atakan Öztürk

Supervisor: Prof. Dr. Halil Altay Güvenir

Jury Members: Prof. Dr. Özcan Öztürk and Prof. Dr. Uğur Güdükbay

Innovation Expert: Kerem Erikçi

Progress Report

October 14, 2019

This report is submitted to the Department of Computer Engineering of Bilkent University in partial fulfillment of the requirements of the Senior Design Project course CS491.

Table of Contents

1. Introduction	1
1.1 Description	1
1.2 Constraints	3
1.2.1 Implementation	3
1.2.2 Economic	3
1.2.3 Security	3
1.2.4 Ethical Constraints	4
1.2.5 Project Scheduling	4
1.2.6 Distribution Network	4
1.2.7 Sustainability	4
1.3 Professional and Ethical Issues	5
2. Requirements	5
2.1 Functional Requirements	5
2.1.1 User Functionality Requirements	5
2.2 Non-functional Requirements	6
2.2.1 Usability	6
2.2.2 Security	6
2.2.3 Scalability	6
3. Existing Projects	7
3.1 Agrivi	7
3.2 Wefarm4	7
4. Conclusion	7
5. References	9

1. Introduction

Computer Science world has a new trendy word 'blockchain'. We met this idea in the early twentieth century. Related with our project scope, we think blockchain could be a remedy for some farmers' problems. Even though in Turkey, there are plenty of agricultural problems, we are one of the most ambitious countries in agriculture all around the world. We need to focus on lack of planning in agriculture and having more distribution networks in specific products via virtual trade unions. Related with agricultural problems, all of us have become crop-hungry for a long while. Every agricultural season, many farmers tend to look for another major because of being out of money. What is the reason for having this undesirable situation? We thought that it is partly related with having old agricultural habits throughout the country. All of us, as a part of the country, we need to advance our agricultural culture into a technological way. We offer blockchain integrated smart contract connection among officials and farmers, and also, we offer them a small scope union for distribution of their products, thus they will not be limited to a quota of mass production companies. To exemplify, there are some quotas in having tea crops procedure of Çaykur or some quotas in having sugar beet in the procedure of Konya Şeker Sanayi and Ticaret A.Ş, and so on. So FarM So Good contributes to local small scope farmers for being together as a union and having a smart virtual contract system for farmers. These unions can be determined by computer vision to predict how many kilograms can be taken by this harvest by the recurrent neural network model, and be matched with local small harvest.

1.1 Description

Our Senior Design Project requires an engineer solution for the proper problem you realize or an obvious one. For that project, we propose trying to decrement farmers' several problems. We took unplanned agriculture habits into consideration. It will be an innovative approach for agriculture itself. We offer a blockchain relation into farmer expenses and connection between officials and farmers. To give an instance, a farmer needs 100k Turkish Liras

to make harvest, officials give him 100k valued coins instead via blockchain system. These 100k coins can be useable into officials related departments and supplier chains, it means the farmer could only use that valued coins into related expenses and take whatever he needs. Then process will not stop and will be continuous and there is going to be a win-win system belongs farmer, officials. This process naturally causes that farmers owe officials at beginning of their harvest, after that step they produce and take their harvest. Other than these, we will focus on distributing connection of crops and meeting the need of huge mass production company limits. As an instance, large production companies have their own quotas for buying crops as Anadolu Efes, Çaykur, Konya Şeker Sanayi ve Ticaret A.Ş and so on.

In our platform we look for a remedy for two major problems of farmer; first smaller scope farm crops distribution and second plannable agriculture process. For thinking about the smaller tea crop producer, he needs to have a halftone for per land plots, whereas what if weather conditions in temperatures and rainfall affect the production and thus farmer's crop stays under of the limits. What about that kind of undesired situations does farmer have to be searching for every local tea need to sell his crop? These kinds of lower limitation productions need to be supported. We offer to create small scope trade unions for local farmer crops to stay up the agricultural in that perspective. We are planning to code a mobile application that can be used in farmers' and suppliers' mobile phones to search for a need for specified crop or search for local small scope producers to gather. Thus, local farmers will tend to ingather their crops again because they will have a guarantee to sell their harvest directly to company or indirectly by being together with other farmers. The fields where sugar beets are produced is going to be detected by an appropriate computer vision model. To predict the amount of future products, first, the computer vision model is going to predict the amount of sugar beets in the field, and then, the recurrent neural network model is going to predict the future amount of product in harvest time with the help of the meteorological data.

1.2 Constraints

1.2.1 Implementation

- The User Interface of web application could be built with JavaScript and trendy JS framework React could be used for our application site.
- We are planning to use blockchain technology for offering farmers some kind of smart process model for their harvest.
- We are planning to use computer vision algorithms to train our sugar beets into system with using labelled images.
- We are planning to write a bot that which suggests some points related to meteorological datasets to the farmers.

1.2.2 Economic

- So FarM So Good offers people a unique payment system which will be a bridge between farmers and the government. We will use the blockchain technology for small amount of transactions. Government will deliver assistance to the farmers by using blockchain as coins. Farmers will not be able to spend these coins except diesel fuel, seed, pesticide expenses. Win-win operation will apply to the project because from governments point of view and farmers point of view, the application will advantage them.

1.2.3 Security

- Related with having blockchain based agricultural smart process program, we have naturally more secure program for that process. Because blockchain naturally use powerful cryptography via using combinatorial public or private keys.
- Our suggested shortest path and local farmers harvest rates should be secured by system for data policy.

1.2.4 Ethical Constraints

- Our application's ethical side could be controlled by Bilkent University Ethics Committee.
- Farmers harvest rates, and farmers and officials' relations will not be shared with other third figures.
- Shortest path we suggest or the advices we offer according to our bot will not be deliberately exaggerated or directly inaccurate.

1.2.5 Project Scheduling

- We will do some research about blockchain, our specified bot program, maybe some phenological phases of sugar beet for advancing our computer vision feature and about shortest path algorithms for offerings.
- We will do some research about creating small virtual cooperative application extensions and what is the relation between farmers and suppliers and huge mass production companies.

1.2.6 Distribution Network

- Our platform is a third sided platforms among farmers, huge mass production company named Konya Şeker Sanayi and Ticaret A.Ş and officials, which distributed through web application. All of the works we provide as our senior design project can be seen online and used online.

1.2.7 Sustainability

- We want to be always in contact with farmers, officials and companies, so we can always use their feedbacks. With the feedbacks they provide, we can have sustainable application related their usage. We can edit our program related their tests and feedbacks.

- Bug reports and related reports will always be taken by the system with pleasure, for application's enhancement.

1.3 Professional and Ethical Issues

There will be some ethical issues in application of the project. Firstly, the contract between government and the farmers should not be shared with the public opinion. Since the contract contains sensitive information such as transactions and fees, should be confidential. Secondly, the connection between government, farmers and our project team also should be confidential. Since the connection is open to manipulation, the connection should be kept as a work ethical issue. Lastly, our project will provide the shortest path in order to minimize logistic expenses for the factories. The shortest path will be revealed by using various algorithms. Because of that, this information belongs to So FarM So Good and should be kept as a business ethics.

2. Requirements

2.1 Functional Requirements

2.1.1 User Functionality Requirements

- The companies, willing to see where the sugar beet fields, should see their locations on the map. It will be serviced by an optimized sugar beet detection model [1].
- Farmers should have the ability to create cooperation in the website.
- Companies interested in the specific product should have the ability to notify the cooperation consisting of farmers.
- The fields related to the specific product should be shown on the map as a point whose size is proportional to the area of the field.
- The platform should recommend appropriate farmers to the farmers who are searching for a friend to form cooperation.

- The platform should predict the possible amount of product the farmer is going to get in the harvest time by meteorology data, so that companies have an ability to set their cooperations.
- The platform should recommend cooperations to the companies related to their needs.
- The platform should calculate the shortest path from farmers to the target company by using A* algorithm.
- The farmers should have an ability to submit their needs from government so that government is going to pay bitcoins to the farmers. Farmers can use bitcoins for only farm related things from government.

2.1.1 System Functionality Requirements

- The platform needs to be a mobile compatible web-based platform.

2.2 Non-functional Requirements

2.2.1 Usability

- The platform should have ease of use for our main customers which is the most important part of agriculture. Farmers demand more ease of use for this technological move. Thus, they could use the application easily and willingly.
- Features of application and user interface should be easily understandable.

2.2.2 Security

- The platform should ensure the security of data of users and private information about companies by blockchain system used in the platform.

2.2.3 Scalability

- The platform should be scalable enough to handle the huge number of users and data processing work.

2.2.4 Robustness

- The platform should be robust. Whatever the size of the coming data, the platform should handle it.

2.2.5 Extensibility

- The platform should support easy integrations for the possible features. For example, in the future, health of the products can be detected by going into farmers' field and notify companies.

3. Existing Projects

3.1 Agrivi

Agrivi is a data-driven farm management software which helps people manage every activity on their farm. It gives the people the opportunity to plan, monitor and analyze their farms from planting to harvesting with only a few clicks. Agrivi's core features are farm management, powerful analytics, advanced pest detection algorithms and best practice knowledge [2].

3.2 Wefarm4

Wefarm4 is a cooperation among farmers with the sub-branches of WeFarm4future, WeFarm4planet, WeFarm4Community and WeFarm4Growth. They're aiming to work together, create long-term benefits and empower farmers through cooperatives [3].

4. Conclusion

Blockchain is getting bigger in the computer science world day by day. Therefore, demand is undeniably obvious and continuously getting higher. We propose farmers to use our specified transaction platforms via blockchain algorithms.

We created a system, which depends on coins and we believe this system will be the bridge for the gap of agricultural lack of planning. This planned system consists only two actors inside; officials and farmer. Coins are given to the farmers related with their needs. Thus, they can be easily paid without thinking how I afford the expenses in advance. They can only focus on farm and their owe can be paid by harvest itself. Officials can supply their money back without any loses.

We intend to make a structure which is the union of the small farmers under the one cooperative roof. Firstly, sugar beet farmers will be gathered using application. First criteria for the gathering is local fields which have less amount of crop. After selecting local ones, farmers will be getting together and establish an online cooperative. Thanks to the this cooperative, government and farmers sides will have advantages. State sugar beet factories will take sugar beets from farmers directly. However, today government may buy sugar beets from the cron chandler. Moreover, farmers will take diesel fuel, seed and pesticide assistance regularly. By the win-win situation over the all process, So FarM So Good will remain to the contribute both side. Our project will use Blockchain technology to implement transactions.

5. References

- [1] "Sugar Beets 2016", 2016. [Online]. Available: <http://www.ipb.uni-bonn.de/data/sugarbeets2016/> [Accessed: 13 October 2019].
- [2] "How It Works". [Online]. Available: <https://www.agrivi.com/en> [Accessed: 13 October 2019].
- [3] "How we do". [Online]. Available: <https://wefarm4.eu/cooperation-among-farmers-2/> [Accessed: 13 October 2019].