Visualizations for Record Keeping for Farmers

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1 Introduction

We found data visualization in agriculture to be relatively sparse, and thus a promising area for exploration. Robust tools exist for record keeping and data management for farmers. FarmOS is one example of the tools available [1]. The addition of interactive visualizations to these platforms could lead to an enhanced user experience and assist farmers in analysis of their data.

Based on the data set we will obtain from farmers, we will analysis them and transfer them to the data which is suitable to visualize. Then we will find proper visualization types to visualize them. Using these visualizations, farmers can explore areas, assets, logs information, which may be helpful to their current work and provide references for future planting.

2 One-sentence description

The project will create visualizations to compliment existing data collection platforms for farmers.

3 Project Type

Web Application/platform
Prototyping

4 Audience

Who is the audience for this project? How does it meet their needs? What happens if their needs remain unmet?

The outcomes of our project will directly benefits farmer. Analyzing and visualizing the data collected from farmers can allow them to have a more scientific plan for planting and breeding, which can allow them to have more production and increase their income. Moreover, The platform we developed can also be transplanted to other fields in the future, such as fishery.

5 Approach

5.1 Details

What is your approach?

We will begin by assessing the data that farmers collect. From the platform we are investigating [1] this data includes:

- assets (plantings, animals, equipment, sensors, etc)
- logs which are associated with assets (activities, observations, inputs, harvests, soil tests, sales, movement of assets, inventory)

We have begun seeking input from users and developers of the platform for visualizations that they would find interesting and useful.

We will synthesize this information, as well as what sample data we are able to access, in order to decide which visualizations to produce as a final deliverable. We will also use sketching and the Five Design-Sheet methodology [2] in our design process.

We will seek feedback from users of the platform and others in the field to evaluate our visualization(s).

5.2 Evidence for Success

Why do you think it will work?

Digital tools for farm management are increasing in use and popularity for all scales of farms. Meticulous record keeping has always been an important part of farm management. Digital tools make it easier for farmers to capture, organize, and analyze data.

This is a relatively new area of software development, and one that does not receive a high level of attention/investment. Therefore, we believe it is a field that could benefit from data visualization. We will use processes that we've learned in the course to increase our chances of success for creating successful and useful visualizations.

6 Best-case Impact Statement

In the best-case scenario, what would be the impact statement (conclusion statement) for this project?

Based on the obtained data set we get from farmers, the visualization web application we develop will be really useful for farmers. Farmers will be more intuitive to their area, assets and log and allow them to increase their product.

7 Major Milestones

- Characterize the types of data that are collected by farmers.
- Determine visualization types that are appropriate to the data and potentially useful for farmers.
- Sketching to generate ideas and support the design process.
- Finalize choice of visualization(s) to produce.
- Produce prototypes of selected visualizations(s).
- Evaluate and improve the visualizations.
- Final version of visualizations(s) created in d3.

8 Obstacles

8.1 Major obstacles

- We do not yet have sample data sets to work with.
- We don't know much about agriculture, so we don't know exactly what information farmers want to know, and what they are most interested in.
- It is also difficult to choose the right type of visualization. If the data is visualized with inappropriate charts, it may not help farmers or even mislead them.

8.2 Minor obstacles

- As a web application, in addition to the need to use d3 for visualization, some other technologies may be used, such as HTML, css, jquery, bootstrape etc.
- Since the data set we get form farmers is very complex, it may be difficult to analyze the data.

9 Resources Needed

What additional resources do you need to complete this project?

- Sample datasets
- Code for visualizations

10 5 Related Publications

List 5 major publications that are most relevant to this project, and how they are related.

- Munzner's paper on the nested model for visualization design will guide us in the analysis of the task requirements and the evaluation of the final results. [3]
- Brinkhoff et al. describe an agricultural sensor data logging platform [4]
- The work by Zaini et al. is related, but their context is in the fishery. [5]
- We will use the five design-sheet methodology described here by Roberts to support our design process [2]
- O'Grady provides a review of smart technologies for farming [6]

11 Define Success

When / How do you know if you have succeeded in this project?

We will be successful if our project produces visualizations that are effective, enjoyable, and useful to farmers for analyzing their data.

References

[1] M. Stenta, "FarmOS.org." https://farmos.org/, 2016. Accessed: 2021-04-16.

[2] J. C. Roberts, C. Headleand, and P. D. Ritsos, "Sketching designs using the five design-sheet methodology," *IEEE Transactions on Visualization and Computer Graphics*, vol. 22, no. 1, pp. 419–428, 2015.

[3] T. Munzner, "A nested model for visualization design and validation," *IEEE Transactions on Visualization Computer Graphics*, vol. 15, no. 6, pp. 921–928, 2009.

[4] J. Brinkhoff, J. Hornbuckle, W. Quayle, C. B. Lurbe, and T. Dowling, "WiField, an IEEE 802.11-based agricultural sensor data gathering and logging platform," in *2017 Eleventh International Conference on Sensing Technology (ICST)*, pp. 1–6, 2017.

[5] A. Zaini, D. Wulandari, and R. Wulandari, "Data visualization on shrimp pond monitoring system based on temperature, ph, and do (dissolved oxygen) with iot," *2020 International Conference on Computer Engineering, Network, and Intelligent Multimedia (CENIM)*, pp. 1–6, 2020.

[6] M. J. O'Grady and G. M. O'Hare, "Modelling the smart farm," *Information Processing in Agriculture*, vol. 4, no. 3, pp. 179–187, 2017.