After Action Review Documentation

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Capstone Project - F.L.O.A.T.
April 14, 2022

1. Introduction

Compared to other capstone projects designed this year, our project covers multiple different technologies. The project focused on development in the areas of machine learning, web development, and in-the-field work with the Raspberry Pi. In this after action report, We will explain what we planned out for this project compared to the actual final results. Additionally, we will give a reflection on our work as to what we feel went well, and what we could have done better or differently. Finally, we will give our closing thoughts on this capstone project and share the lessons that we've learned over the past seven months of development.

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Section 2: Project Expectations

2.1. Purpose and Objectives

When the project began, the desired purpose of our project was to create a system that gathers information for garbage and specific waste in the Earth's large bodies of water. We proposed for a live feed camera to record and relay information directly to our website as detections were made. As mentioned in early scrum meetings, we wanted the detections to be available to view on some form of frontend, like a website or a mobile application.

Early within our development we decided to widen our scope to include detections of water parameters. This decision is influenced by mentor feedback and field research on bodies of water. As it stands, water sampling occurs almost every quarter year. F.L.O.A.T. is our proof-of-concept project that eases supervision of the water qualities of any body of water which then logs and trends this data to the customer.

2.2. Stakeholders & Project Audience

Ideally, when our project first started, we wanted our project to be relevant to a global audience. The scope for this project changed and became more reasonable when we decided to have our scope target Saskatchewan waters primarily. Dr. Christine Chan, our faculty mentor, was able to assist in getting us in contact with a previous student at the Government of Saskatchewan. This contact acted as our customer, and we focused a large portion of our development on a web application and information gathering system that could be of use to him and his department.

2.3. Planned Project Timeline

With the initial plan of our project, the work done for this project was divided into our own individual work. For specific features we would do our own individual research on the features and then continue with development. A large portion of our project planning did not equate to the necessary time to learn how to incorporate certain features and adequately handle fixing bugs in our code or hardware.

For the second half of the capstone course, the hope is that we would have enough progress with hardware and software development that we could begin testing shortly after the beginning of the second semester. Obviously this is easier said than done, because some functions or hardware will just take more time to implement and configure properly. Our goal was to have the last few weeks of the second semester to fix and iron out bugs in our code, develop a solid and informative presentation, and plan out an attention grabbing project booth concept.

2.4. Planned Project Vision

In the initial planning stages of the project, our end goal regardless of how we gather information was to have a proof-of-concept prototype where customers can have a visible log of documentation online. It was unclear as to whether the majority of this information would get gathered and documented to our website live or after the boat rides were complete. We chose to aim for live feed implementation, but we agreed as a group that if the implementation was not efficient we could opt for gathering information during the boat ride and analyzing it after the fact.

Section 3: Project Results

Compared to the planning of our project, here is how our capstone project performed and the results we have gathered.

3.1. Purpose and Objectives

When reflecting on the final results of our project, we changed our scope from a project which was focused on improving the quality of large bodies of water to the smaller scope of targeting and specifically aiming to improve the quality of local Saskatchewan waters. Our proof-of-concept project ended up recording water parameters and underwater video data over a period of time, and using that data in further analysis and website logging after the fact. The final version of our project resulted in having our data available in an easy to view and easy to navigate website frontend, which did align with our initial project expectations. In addition to this, we also included an information knowledge base page, to help users who may not be as knowledgeable in regards to water quality and certain water parameters understand the purpose of our project and its information gathering capabilities.

3.2.   Stakeholders & Project Audience

As it was mentioned above, our project quickly focused on that of local Saskatchewan waters, and was designed with the Government of Saskatchewan's environmental department in mind. Throughout our project's development, we consulted our contact at the Government of Saskatchewan frequently for his input and advice on the types of water parameters we should include in the final result of our project.

3.3.   Actual Project Timeline

When looking back at our original project timeline compared to how we actually approached it as a group, there were a few differences in how we actually approached development. For example, the construction of the boat took longer than expected specifically due to how long it took for parts to come in. Additionally, machine learning training extended much farther into the second semester than we had planned. In saying this, the extended time spent on training and testing our object detection model proved to be beneficial to our final product. The extended time taken to iron out specific features of our project actually caused our last two weeks of development to be rather hectic and pressed for time. Which is less than ideal when reflecting on the project as a whole.

3.4.   Overall Results

Generally speaking, when observing our overall project results compared to our initial project proposals, we feel as though we were rather successful with what we set out to accomplish with our project. Although we did not achieve all planned features due to inability to implement these features, or unexpected errors. As a proof-of-concept capstone project we feel as though we executed the data collection, data analysis, and data logging process efficiently, effectively, and in a readable and understandable way. This is a project we enjoyed learning about and developing, and it is a project we have both agreed we would not be opposed to continuing in the future.

Section 4: Group Reflections

4.1. What Went Well and Why?

Overall, when reviewing our project and the product we produced, we as a group were rather satisfied with the results. In the various environments in which our project was developed, we had numerous aspects that we were proud of. On the machine learning side of our project, we as a group were rather happy with the accuracy of our model after making serious changes to it. Additionally, we were proud of how our individual components were able to communicate with one another, to create a visually appealing final product.

4.2. What Could We Have Done Better?

When looking back on the past seven months of development, there are only a small number of issues with our project that we feel as though we could have done better. For the long term development, we feel as though we could have implemented more consistent timelines, to keep ourselves on track and efficient with our work. Additionally, we think had we done an additional few weeks of research into the architecture of our project, we could have had a much stronger final product that was more in line with our original project proposal.

4.3. What Would We Have Done Differently?

When looking back on our capstone project with the knowledge we have now, it is a lot easier to consider what we would have done differently compared to what we did wrong. For the web development portion of our project, we feel as though it would have been more beneficial to have implemented a different stack, perhaps one like angular and spring boot which is a more commonly found industry standard. For the machine learning and raspberry pi development portion of the project, we feel as though lots of time could have been saved and spent elsewhere had we instead used a newer version of our yolo architecture. This is due to the fact that the newer versions contained features that we had hoped for in our final product, but our current version did not.

Section 5: Closing Remarks & Lessons Learned

To conclude, we wanted to provide the most applicable lessons we have learned over the last seven months of development during this capstone project. These lessons were learned often through mistakes and introspection, and we feel as though sharing them will benefit ourselves and future capstone teams.

5.1.   Learn to Love Documentation

When it comes to a capstone project, documentation is paramount to your success as an individual and as a group. In the work environment, and especially for a capstone project, you can not skimp on documentation, it's a large requirement for a software project such as this, so you should learn to love documenting your work. Documenting your individual progress, current area of focus, and logging your hours of work at the beginning of your project can all be simplistic ways to show that you are working hard on your project, and show your mentors exactly what you are working on.

5.2.   Set a Schedule and Stick to It

While it is difficult to know how long certain features will take to develop, we feel as though it is imperative to a group's success to set a schedule and to actually stick to it. A capstone project is no easy feat, students have to perform serious professional developments while also taking other courses in their final year. Setting a schedule and sticking to it allows for us as students and future software engineers to be consistent, be accountable, and be effective in our work.

5.3.   Progress is Progress

Tying directly in with our advice on setting a schedule, any form of progress is considered to be good progress. A few hours every night of research or project documentation will benefit your group project in its long term development.

5.4.   Last Minute Development Changes Are Dangerous

In the final weeks of the capstone project, as a group you may feel pressured to change or adjust certain features of your project. While we wouldn't consider this to be a bad idea, ensure that these changes will not seriously harm the longevity or effectiveness of your capstone's project.

5.5.   Work With What You Know

Finally, we highly recommend that you work with something that you know or have experience with. Capstone projects are meant to be innovative, interesting, and in many cases a flashy example of your skills as a developer. While it is not detrimental to develop code in an area you have no experience in, learning curves can put a large hindrance on success. Hence why we recommend you work to focus on an area of software development that you have experience in and can show your mastery in.