



Design Studio 2021-2022

Kiewit Drone Progress Tracking Application

Project Retrospective

Overview

This document serves as the retrospective for the Kiewit Design Studio 2021-2022 team. It spans the team's learnings over the past year, describing what areas of the project and process were successful, what should be continued, and recommendations for future teams and Design Studio overall.

Project Description

The Kiewit Drone Progress Tracking application serves as a digital management system that supports tracking the progress of solar panel construction sites in a more streamlined way. It hosts a machine learning model that was built in-house. It predicts the progress of the construction site based on drone-captured geo-location tagged images called GeoTIFFs. The application hosts these GeoTIFFs and allows for the creation and display of labels that ultimately help train and run the machine learning model. The development of this application will increase accuracy and accessibility for the current solution and provide the platform for expansion to other construction project types.

Retrospective

The Kiewit Design Studio team learned a great deal this past year on requirements elicitation, software engineering, and the software development process. Below is the team's retrospective of the year-long project.

Keep

Managing Sponsor Expectations

A great deal of our project work was exploratory and research-based as we tried to decide what tools and processes were most effective. As we uncovered new information, we updated our sponsors on the results and implications. Our team was unable to create a fully automated process and rework the machine learning code, but we communicated these decisions with the sponsors multiple times throughout the year as they occurred. We also provided room for our sponsors to help decide what features they wanted more than others. Including them on these decisions and providing them with the pros and cons of each choice allowed all parties to feel confident in the decisions.

Agile Practices

While our project was not entirely agile the entire year, we would try to work every piece of work into a sprint when possible. This allowed us to better track the work everyone on our team was doing, especially as our team grew with an additional developer and intern second semester. We also hosted a few sprint retrospectives which were very insightful for the team and helped keep morale up. We wanted to ensure every voice was heard and every team member felt valued and confident about the work they are doing.

New Best Practices Format and TL Meetings

As the best practices format shifted, the team felt a lot more connected to the work we needed to accomplish. It all felt relevant to the project and we liked the flexibility a lot more than the previous rigid assignment. It also made our TL meetings feel more productive. Our TL Justin provided a lot of great insight at the beginning of the Fall semester and having the structure of development tickets in the Spring kept everyone on the same page for where our team is at in our project. Continuing this format would be very beneficial to future teams.

Relevant Special Topics

While adding another presentation is never going to please students, making the presentation on a topic relevant to the team was so much better. It took minimal work to create the special topics presentation and felt like we could double-dip into work we have already poured into the technology on our product. These should continue to be relevant to individual teams.

Stop

Poorly Set Boundaries and Roles

One area the team (particularly leads) struggled with at the beginning of the semester was not clearly setting boundaries and roles for team members and our sponsors. Initially, our sponsors wanted to host the sprint planning meetings and review our code line by line on a bi-weekly basis, among other things. Communicating the roles of the sponsors and the leads earlier would have helped clear this up.

Unorganized Sponsor Communication

Our team had unclear expectations of how to communicate with our sponsors throughout the year. Our primary technical contact had to inform us about repeat questions between multiple developers and questions at all hours of the day. While they were happy to help us out, setting more clear expectations of who should be contacting the sponsors and when would have made the communication more streamlined.

Unclear Project Descriptions and Expectations

Our team was under the assumption we would primarily be creating and improving an AI solution for the year. We are not sure where the line of communication was dropped, but it was frustrating to learn shortly after team formation that an AI already existed and we were to improve upon this solution. Additionally, the team determined after that discovery that we needed to build a full-stack application and do a lot of front-end work, which caused issues with our sponsor. That is what we ended up building for them. Managing what the project actually is before formation or possibly even lead selection will ensure teams have developers who are more interested in the work they are doing and sponsors can anticipate more what their project will look like.

Start

Pre-Semester Requirements Elicitation

This point piggybacks off of the last point in the ‘stop’ category, but faculty performing some sort of requirements elicitation before the semester starts would help eliminate some of the issues we ran into and subsequent communication as well. Having sponsors or technical contacts give a brief pitch or similar will ensure DS staff, sponsors, and future team leads and members are all on the same page for the requirements of the project and the underlying problems.

Earlier Scope Review

Our team overall did a great job managing sponsor expectations and the scope, but there is always room for improvement. Reviewing this scope very early on would help alleviate any stress throughout the year and ensure sponsors are happy with the end project. We should have spent more time asking the appropriate questions to sponsors to get to the root of what they wanted, as well as ask questions about any technologies they have already tried for the solution.

Review

Success

Our team believes our project is overall successful but it is important to note what we are defining success as for the project. Based on our team’s vision statement, “*Develop an interactive full-stack application that automates our improved AI system to efficiently track the progress of solar projects for Kiewit employees*”, our team has seen success. We developed an interactive, full-stack application that automates pieces of the AI system as it was given to us. However, our sponsor’s initial goal for the solution was to create a fully-automated system and refactor the entire AI model to get a higher accuracy percentage than the starting point. We had to change and refine our scope as we uncovered the project’s intricacies throughout the year. We accomplished and learned a lot and are excited to see the future of this project. We created a solid minimum viable project that Kiewit is sending over to an additional development team out of state. Proving the concept and vision for this project provides immense value to Kiewit as they look to invest more time, money, and resources into this concept.

Sponsor Fit

Kiewit has been a sponsor for Design Studio projects for many years. This specific project was our primary contact Jake’s first time sponsoring a team. Overall, Jake and our technical contacts Mat and Arulvel were very helpful and supported us in our endeavors. There was a bit of a learning curve at the beginning of the semester that we touched on previously in defining roles and the purpose of Design Studio in relation to sponsors.

Project Fit

Our experience with the project was a bit overwhelming. Every team member definitely learned new skills and technologies while working on this project, which is the purpose of the class. Our team also had room to explore and innovate for the solution of the project. However, this project would have been better suited for a planned two or three-year project. Our original scope was massive and had we not reevaluated our scope, we would not have seen success. If we had gone into this year knowing it was the first of a few years on this project, we could have focused even more on one area of the project and developed a more holistic solution for one area rather than ending the year with a minimal viable project for Kiewit. It was not known at the beginning of the year the scope of this project and therefore it is hard for us to recommend or not recommend this type of project. Many times in industry, project scopes will expand rapidly and development takes longer, so we gained a lot of value and insight through this process. It did, however, make it difficult to make this a one-year completed project as Design Studio is intended to be.

Additionally, the scope of work that the leads and team were given was blatantly incorrect and the actual scope of work was an entirely different type of project. Many of our team members were interested in this project for the AI aspect and this was ultimately a front end, with the scope of working citing “little to no front end work”. In the future, it would be imperative for Kiewit to spend more time refining and coming to agreement on the scope of work before giving it to a Design Studio team.

Advice to Future Teams

Learning to manage scope and expectations has been the most valuable insight from this project as it relates to a future working in industry. Working with sponsors to figure out what is realistic and what might have to be saved for later was a critical part of the success of our project. We would recommend doing even heavier requirements elicitation, potentially for the entirety of release 1, to ensure the project and scope are well defined. It will save a lot of effort looking down the wrong paths and ensure all parties are satisfied with the result.