

EE/CprE/SE 491 WEEKLY REPORT

Start Date – End Date: 09/27/2024 - 10/3/2024

Group number: sdmay25-18

Project title: Weather Triggered Wireless Telemetry System

Client &/Advisor: Daji Qiao and Sarath Babu

Team Members/Role:

1. **Alex Chambers:** Individual Component Designer
2. **Alexander Christie:** Client Interaction
3. **Adam Fields:** Data Formatting
4. **Nisha Raj:** Team Lead
5. **Aidan Gull:** Component Integration
6. **Colin Kempf:** Documentation

Weekly Summary

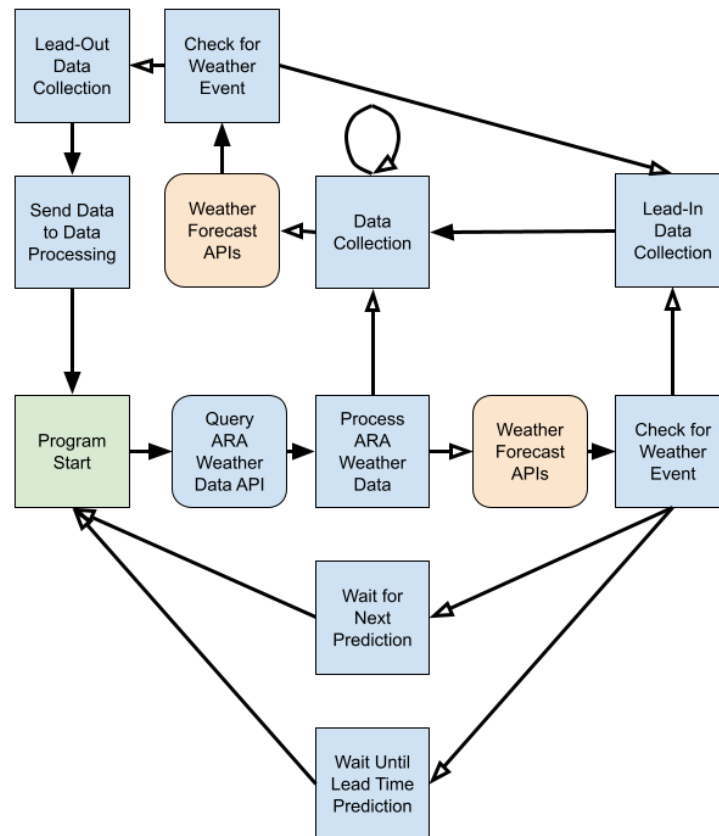
This week our group met to create a state diagram and update the individual component designs that we created the previous week. In our meeting we discussed what aspects of our original designs worked and what was unnecessary or not optimal. As we now have a better understanding of our project and the data we are using, we were able to look at our old models through new lenses. We realized a new way of predicting weather events that combined the gather data and predict weather event components and removed the scheduler design we were originally going to use. This new design improves on the old by creating checks for false positives and false negatives, and takes into account events that occur immediately after another. By removing the scheduler we now focus on just the next predicted event, rather than continuing to write and overwrite multiple events.

From this design breakthrough, we redesigned the individual component designs, also incorporating feedback that we received from our previous meeting on the original designs we shared. Also based on our new design and understanding of how predictions will work, we created a state diagram to visualize this process to our client. In addition to these design aspects, we also did research on different weather APIs we could use for gathering predicted forecasts. We researched 8 different APIs and found 3 of those 8 that could possibly work, eliminating the others for not meeting our requirements. We also worked on improving our website design and adding our groups information to it.

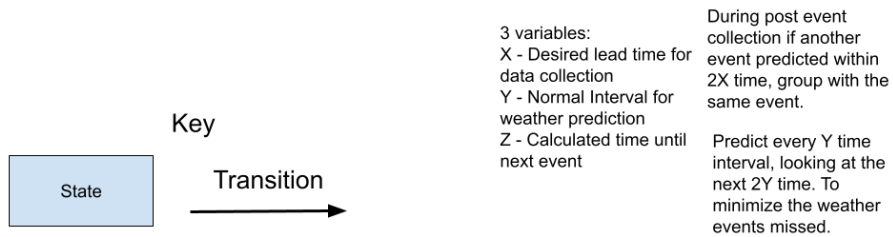
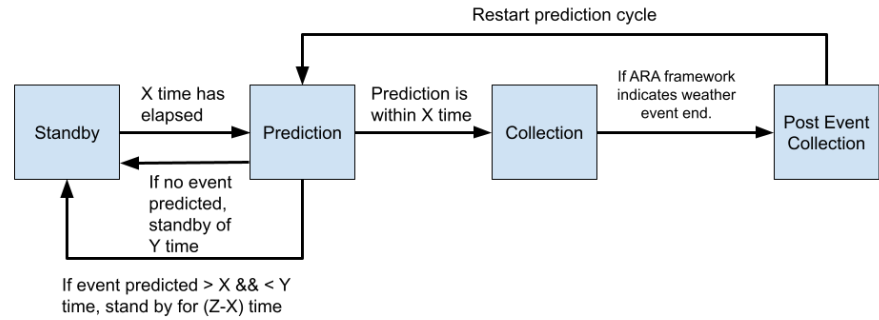
Past week accomplishments

- **Update Individual Component Design - Colin Kempf, Alex Chambers:**
 - Redesigned the Gather Data and Predict Weather Events components to be one combined component.
 - Modified how the program will look for predicted events. The design now checks for only the next predicted weather event, and uses it to inform how often we continue to predict and when to start recording data.

- Design includes possibilities for predictions of false negatives and false positives in continuing to check ARA Framework for weather events.
- The component also looks to make sure that there is not another weather event during the lead-out time of a weather event, and combines them as the same weather event.
- New Component:



- **State Diagram - Alexander Christie, Nisha Raj, Aidan Gull, Adam Fields:**
 - Created a state diagram to demonstrate the different states of prediction
 - The state changes based on if a prediction is found, and how far away that prediction is.
 - Includes basic variables (explained in the figure below) to represent the amount of time detected between events. The variables will be determined as we figure out what works best for the program algorithm.
 - Prediction State Diagram:



- **Weather API Research - Nisha Raj:**

- Researched 5 different weather APIs
 - Determined a pros and cons list for each weather API
- Determined the 3 best APIs are:
 - Tomorrow Weather API
 - Open-Meteo
 - National Weather Service API
- These APIs above allowed for the most calls for free and provided us with best usability including easy integration with the project.
- The Tomorrow Weather APIs requires an API key but allows for a clean and smooth integration with projects.
- Also, these APIs had multiple weather layer data that we found relevant to our project.
- We determined that:
 - WeatherBit
 - Open-Weather Map
- Were not viable options because they were not free and did not allow for many calls from the API.
- These APIs did not allow for a smooth integration with the project either.

- **Website Design - Alexander Christie:**

- Added project summary
- Added personal information for each group member

Pending issues

- No major issues came up this week that still need to be solved.

Individual contributions

<u>NAME</u>	<u>Individual Contributions</u>	<u>Hours this week</u>	<u>HOURS cumulative</u>
Nisha Raj	-Researched different weather APIs -Compared the pros and cons of each weather API -Worked on creating a finite state machine for different weather states of the weather prediction system -Helped update the powerpoint with new diagrams	10	22
Alexander Christie	-Drafted project summary for the team website -Updated personal information for team members -Created finite state machine for the various states of our weather prediction system	8	20
Aidan Gull	- Created the state diagram to show the different states of the weather prediction. - Helped update the presentation with the state diagram as well as a brief description of it	8	22
Colin Kempf	- Help to come up with the major changes we have made to our designs by removing the scheduler. - Worked on the updated individual component designs with Alex Chambers, merging the old components and incorporating feedback.	8	22
Alex Chambers	- Helped come up with new overarching software design by removing use of scheduler - Helped update individual component design for Weather Prediction and Data Collection (now component is both)	8	22
Adam Fields	-Helped create the state diagram to show the different states of weather prediction -Presented the state diagram to the client and the advisor.	7	19

Plans for the upcoming week

- **API Research**
 - Create demos to show during the next client meeting which get data from an API and show how the data from that API is received and formatted.
 - Highlight what data is retrieved and what data will be helpful to our project.
 - Look into how we can use multiple APIs in our project to verify predictions so that our project is more accurate.
 - Discuss how this will look in our prediction of events. One APIs' next

forecasted event may be different from others, so how do we choose when to collect data?

- Research more APIs we could potentially use.
- Research pulling and pushing from APIs.
 - We know we will likely end up with a combination of both.
- **Low Level Prototype**
 - Create a very basic prototype showing how we can use data from APIs to look for a forecasted event.
 - According to the client this should be very simple, mostly a framework to demonstrate how we imagine translating our designs to code.

Summary of weekly advisor meeting

Our meeting this week took place on 9/30. During our meeting we presented our updated individual component designs and the predict state diagram. Through these visuals we explained our changes to our initial designs and our new system for predicting events and informing when to gather data. We also answered questions about how our designs deal with false positives and false negatives, as well as our ideas for lead-in lead-out times and how that is worked into when we predict events. We also presented our API research, going over the 3 APIs we found that would work well for our purposes. We also showed some of how the data from these APIs looks once called. We then talked more with our clients about what they want us to be working on next, and what they would like to see for the next meeting.