Architectural Spike Report

Auburn University Growing Degree Days App

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During the Architectural Spike we accomplished several things. We started by meeting with our sponsor, Dr. McElroy, about our project and his requirements. Our project is to design an Android and an iOS application that can calculate the growing degree day of certain plants, especially various weeds that cause problems for turf grass. A growing degree day is calculated with the formula: growing degree day (GDD) = Σ [(Tmax - Tmin) / 2] – Tbase, where Tbase is a value that varies depending on the plant. Growing degree days are used to calculate when the different phases of a plant’s life cycle start, such as seed germination and other biological processes. You can use that information to know when to apply pesticide, fertilizer, and other things to maximize plant growth. This application will take in a zip code, start date, fetch the maximum and minimum temperature of each day for the longitude and latitude coordinates for that zip code, and calculate the GDD based on the formula given above.

To retrieve the maximum and minimum temperatures for each day, we decided to use the weather API from developer.forecast.io. We looked at several other APIs, including Weather Underground, NOAA, etc., but decided on forecast.io for a couple of key reasons. First, it was by far the cheapest. With forecast.io, the first 1000 calls per day are free, and every preceding 10,000 calls are only $1, whereas the other APIs were hundreds of dollars. Second, and more importantly, we could retrieve all of the data we needed in each API call, with lots of extra data in case we need it to incorporate some of the more complex formulas Dr. McElroy mentioned, such as hourly data for humidity and dew point.

For the architectural spike, our goal was to get basic functionality programmed for the Android application. We implemented a simple graphical user interface, which will be improved in subsequent design cycles. Presently we are calculating the growing degree days only for smooth crabgrass while we wait on the actual base values and grass from Dr. McElroy, which we should be able to get during our next scheduled meeting. To get the user’s location, he or she is required to enter a zip code, which is then automatically converted to latitude and longitude coordinates. The user also enters a start date for the GDD to be calculated with. We convert the date to UNIX time to give to the forecast.io API calls and use that to get the maximum and minimum temperatures for each day in the range.

For the next cycle, we want to have the Android application functionality be more robust and have the iOS application essentially reach the same development threshold as the Android app did in the architectural spike. Our goal for the Android application is to have support for the full list of plants Dr. McElroy will give us and to start working on implementing automated background service daily calls to allow us to send notifications to the user without having to manually check the app each day. Based on our time estimates for that task, it is more likely to be completed in the second cycle, but we hope to begin work on it next cycle, if time permits. We plan on using the third cycle to finish the iOS application and improve the user interface on the Android application. We also plan on meeting any requirements Dr. McElroy brings up in the future.