General Discussion

This section will look at the project as a whole, how it relates to similar solutions already on the market and how it meets the aims set out in a previous section.

The project as a whole has been very successful in terms of producing a hardware and software system that accurately collects, records and displays data about a specific plant. Whilst on paper this may seem like a trivial exercise, translating this into a system that is robust enough to deal with changing variables while collecting useful information is quite another challenge. It would not be enough to build the hardware system and have no where to send the data for display just as it would not be sufficient to develop a website and hope that the sensor data would be displayed in a human readable format. Care had to be taken to ensure that the data collected from the sensors was in a human readable and useful format before it was sent to the database. The database itself had to be designed in such a way that the website could access it easily and simply extract the data it required. The website then had to use this data to power graphs and charts that the user could use to track the status of their plant over a given time frame.

It is important to evaluate the project in regards to similar devices currently on the market. The Plant Monitoring System created by Ryan Gill uses similar components to achieve a similar result, but it relies on slightly inflexible open source software to collect and render the data. The system developed by the team has enough scope that sensors can be added with only slight alterations to the code base, should the client wish to produce a range of products, such as an entry level model to an expert model with stages in between. Gill’s system also requires technical expertise to put it together, a factor the developed system negates. The total cost of Gill’s system is slightly less than the teams system, but any potential saving is destroyed by the technical knowledge required to build it.

The Elecrow Smart Plant Watering system again uses similar components, but adds in the feature of remote plant watering. However, this not only greatly inflates the cost to be over£100 more expensive, but the technical knowledge required to build it is vast. This system also avoids any data collection and uses only moisture sensors to coordinate its operations. However, the inclusion of remote plant watering makes it a very interesting device and should be considered in future iterations of the developed device.

The Smart Garden System by SwitchDoc is perhaps the industry leader in regards of smart plant monitoring. It uses a Raspberry Pi in place of an Arduino, which gives it much more processing power and the ability to add sensors and modify the code. However, it requires some technical knowledge to put together, takes up a much larger footprint and is also much more expensive that the developed device. The ability to monitor more than one plant from the same ‘brain’ is a highlight, as is its integration with digital assistants like Amazons Alexa.

All of the devices mentioned do very similar things as the developed device as well as features beyond the scope of this project. However, they all suffer from the same flaw: they require specialised knowledge to build, operate and maintain. This is where the developed device stands on its own.

In a previous section, the aims of the project were laid out. It is important to evaluate how well the project meets those aims discussed.

The high-level aim that was set out stated that a product should be created that met the needs of the modern gardener, both those just discovering the field of horticulture as well as more seasoned individuals. The goal here was to develop a system that was not only easy to setup and use, but also one that would feedback useful information to the user that they could then use to make informed decisions. Overall, the project achieves this aim well. The physical device has been developed to include as little peripheral modules as possible whilst still maintaining a high degree of usability. To set up the device, the user has only to place the sensors where they feel is most accurate and then power the device on. Inserting data into the database is done automatically upon a WiFi connection being established. The user then has to register with the companion website to view the graphs and charts powered by the collected data. The website has been designed for use with mobile and desktop devices in mind, a design consideration with both ‘digitalized millenials’ and more mature members of society. A young professional can check on the status of their plant whilst on the evening commute, while a retired individual can use the historic information collected to chart their plants progress from their desktop PC, allowing both to develop new strategies and refine those currently in place.

In addition to this over-arching aim, several smaller aims were identified.

Firstly, the website had to be responsive in order to display correctly on a mobile device as well as desktops, laptops and tablets. Consideration on which browsers being used played a part here, as older users may be prone to continued use of legacy browsers, such as Internet Explorer. Navigation and content of the website was also a crucial consideration, with the aim of ensuring as few button clicks as possible resulted in the user locating the desired information.

Secondly, the device had to be easy to maintain with little or no expert knowledge required, as well as perform in a reliable manner. The developed hardware device is essentially ‘plug and play’, with the user having merely to place the sensors and power the device on. The components used are rugged enough to withstand repeated use but also simple in their operation. The reliability of the device is dependent on the WiFi connection. If a users WiFi service was to be interrupted, sensor readings may not be placed in the database. This, however, is outwith the scope of the team but in attempt to less such an impact, sensor data is only sent to the database every thirty minutes.

Lastly, collection of data had to be undertaken in a manner appropriate with current legislation, with consideration being given to how these laws may change in the future. While the hardware device is geared toward collecting data, the only piece of personal data the user has to provide is their email address. This is so that they can register a username and password for use on the site with the email address only being used should they request to set their password. However, the website does contain a ‘Remember Me’ function that uses cookies to store session information. To inform the user of this, a pop-up is generated when they visit the site to inform them that cookies are used. After agreeing with this, they are free to use the website. This follows GDPR legislation dealing with the collection of cookies.

It is fair to say that the overall project meets the needs of the client as well as the aims set out. The client wanted an intuitive, adaptable system that could collect, record and store data on a given plant. This was achieved. The aims then expanded on the clients needs to ensure the device was reliable, responsive and easy to use. This was also achieved.