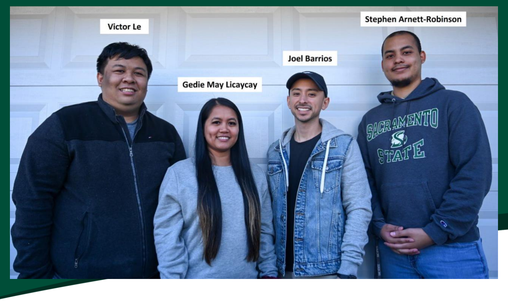
Smart Hydroponic Garden



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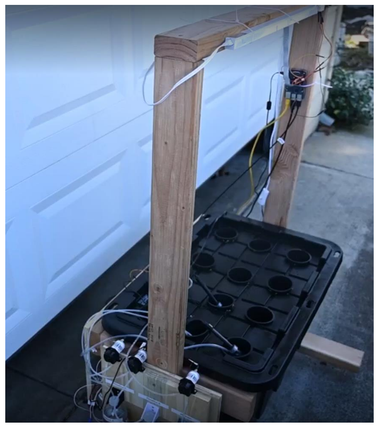
PROBLEM STATEMENT

The problem we are addressing is food waste. Food waste is a global issue and has been a problem for many years. Throughout the food distribution chain, there is food waste in every step of the process. Our solution is to bring food production into the consumer's homes. This would reduce food waste by shortening the production chain. The most important aspect of this project is that we automated crucial components to food production. We wanted our light source to self-adjust to be able to augment natural sunlight with artificial lighting when the system does not receive enough sunlight. We also wanted the system to adjust the water conditions by inputting enough fertilizer to lower the pH level to ideal conditions. The system will also alert the user when the water level is low, so they add water. The end goal is for the user to only plant the seeds and add water to be able to enjoy all the vegetables without all the labor. A problem we see is that maybe not everyone has a green thumb and that plants may get sick. To address this, we also implemented a camera connected to the Raspberry Pi that uses machine vision to identify diseases.

BACKGROUND

Our hydroponic system will be unique because it would require minimal user interaction to grow food. The setup would fit in small spaces and will be inside a closed container. Data from our system will be collected using sensors that will measure temperature and humidity and a camera with AI capabilities to observe nutrient deficiencies in the coloration of our leaves. We will not only capture data but also be able to adjust certain features such as nutrients, pH-level, water-level, and exposure to light.



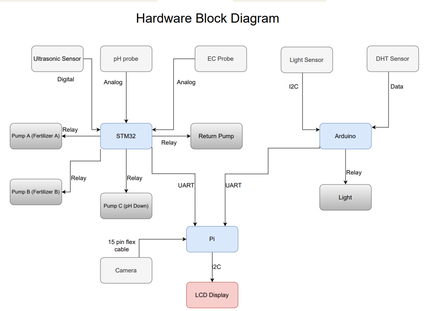
SUMMARY OF WORK

Feature list:

- Water level monitoring
- Temperature & humidity monitoring
- Automated fertilizing & pH adjustments
- Light monitoring & self-adjustments
- Plant health monitoring

Figure 1: (above and left) CSUS Senior Project Team 8 members
Figure 2: (Left) Hydroponic system prototype developed by Senior Project Team 8 members.

Figure 3: (above) hydroponic circuitry and seedling setup
Figure 4: (left) Plant grown in the prototype for 7 weeks
Figure 5: (Below) Hardware block diagram



IMPACT ON COMMUNITY

The intended, long-term impact of this work includes:

- Reduce the need to buy fruits and vegetables.
- Enables users to grow their own produce in an automated fashion
- Simplifies the growing experience.
- Helps people learn more about gardening.
- Reduction in food waste by bringing food production to homes it shortens the food distribution chain.