

# Peaceful Gardening

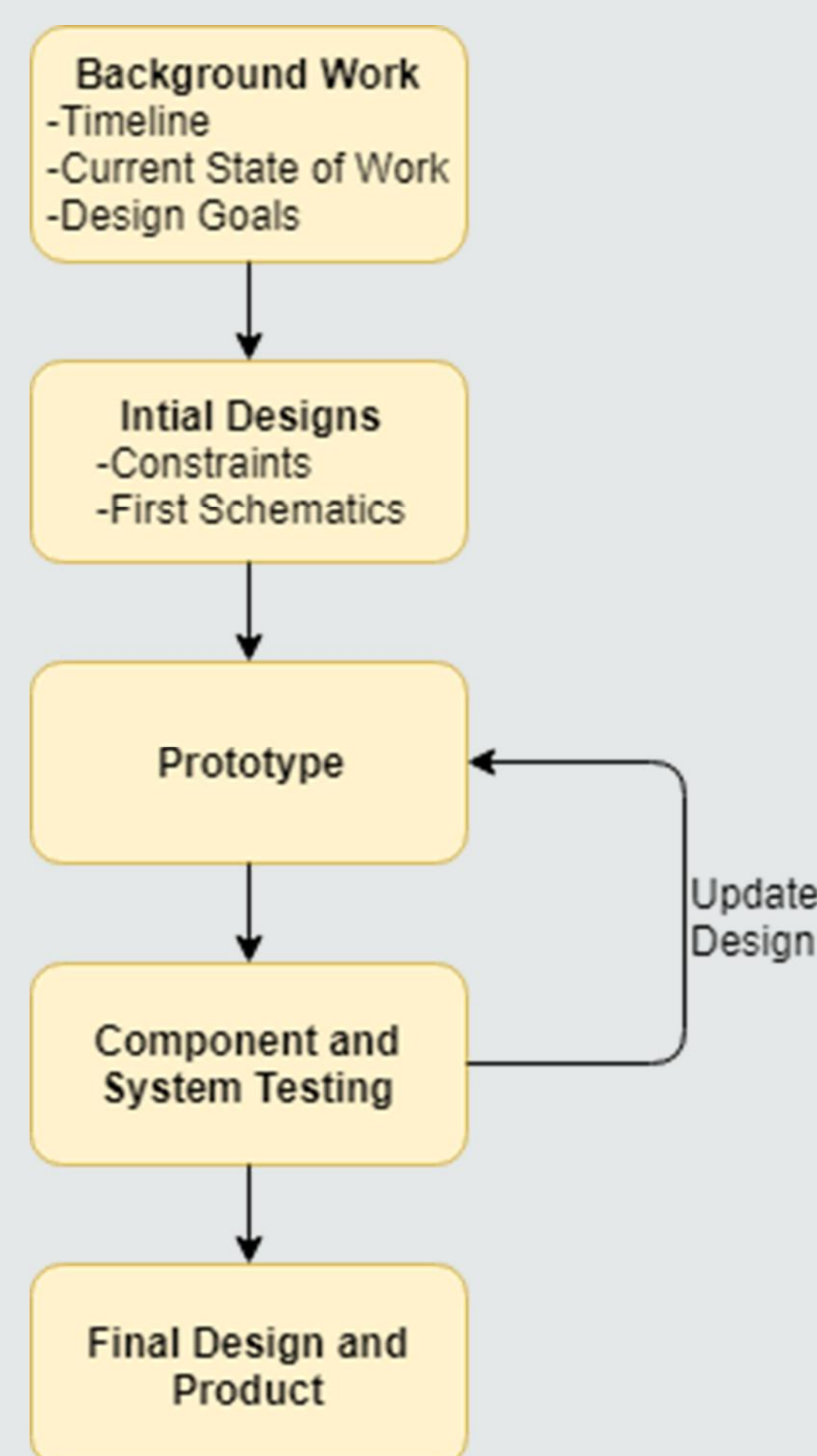
## Background

Deer populations entering gardens is a common issue in rural and sub-urban areas of Nova Scotia. They cause damage to gardens by eating plants and destroying both natural and artificial decorations. A common solution is to build a fence around the garden, however many people do not want to fence their garden in for aesthetic or practical reasons. Other solutions include hunting and trapping, which is often ineffective for large populations and uncomfortable for many people.

## Project Description

The main objective of this project is to develop a device which can deter deer from a garden without the use of a fence. This is to be accomplished using a moving "beast" and audio to scare off deer. The device must be activated using a motion sensor, so that it is only activated when deer are nearby. The motion sensor must be separate from the other components, and communicate wirelessly with the "beast". Both the motion sensor and the main components must be solar powered so that they can function outdoors year-round. They must also be weatherproof so that they can function in rain or snow. Creating a device that fits these constraints would allow gardeners to protect their gardens from deer without the need to invest in a fence.

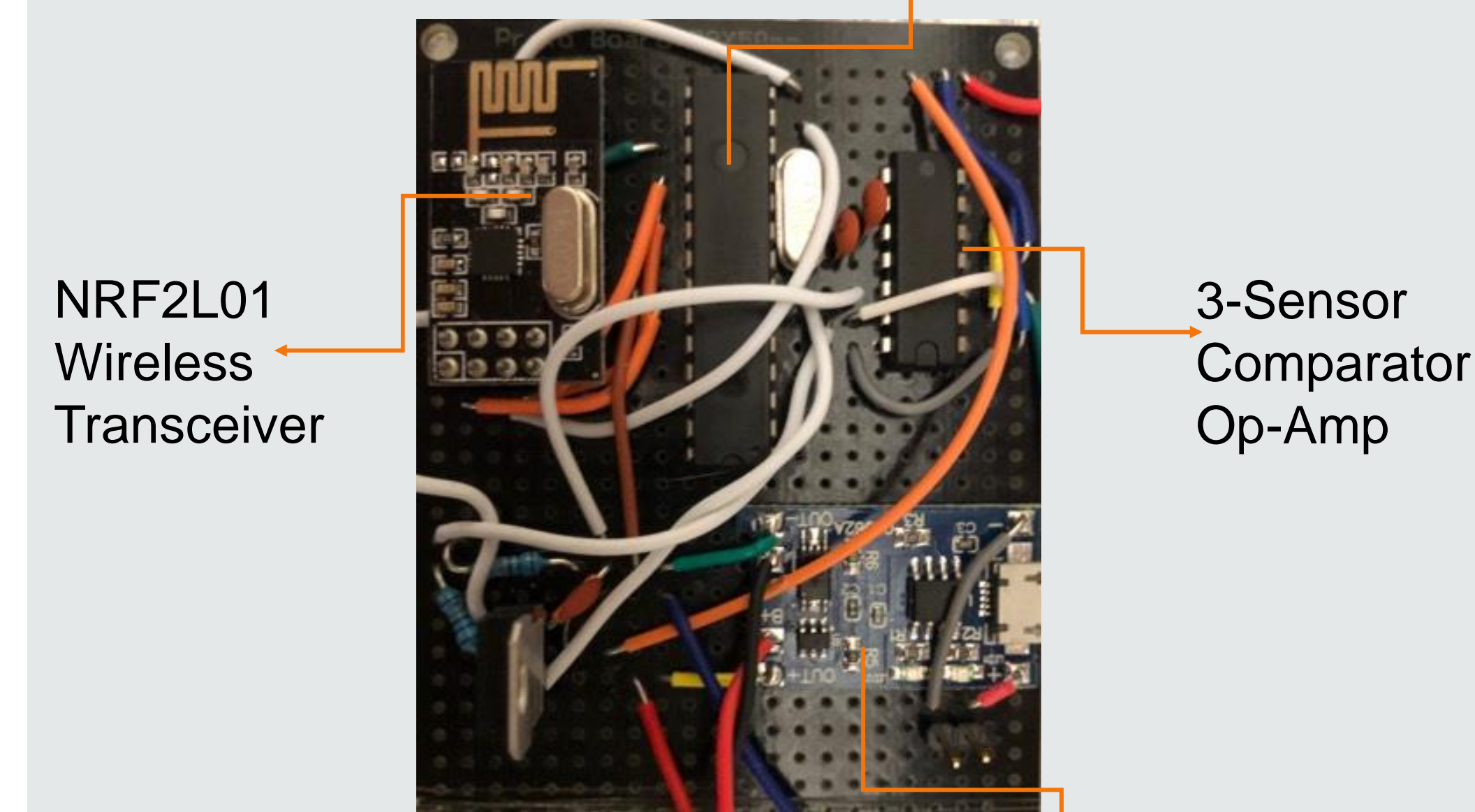
## Design Process



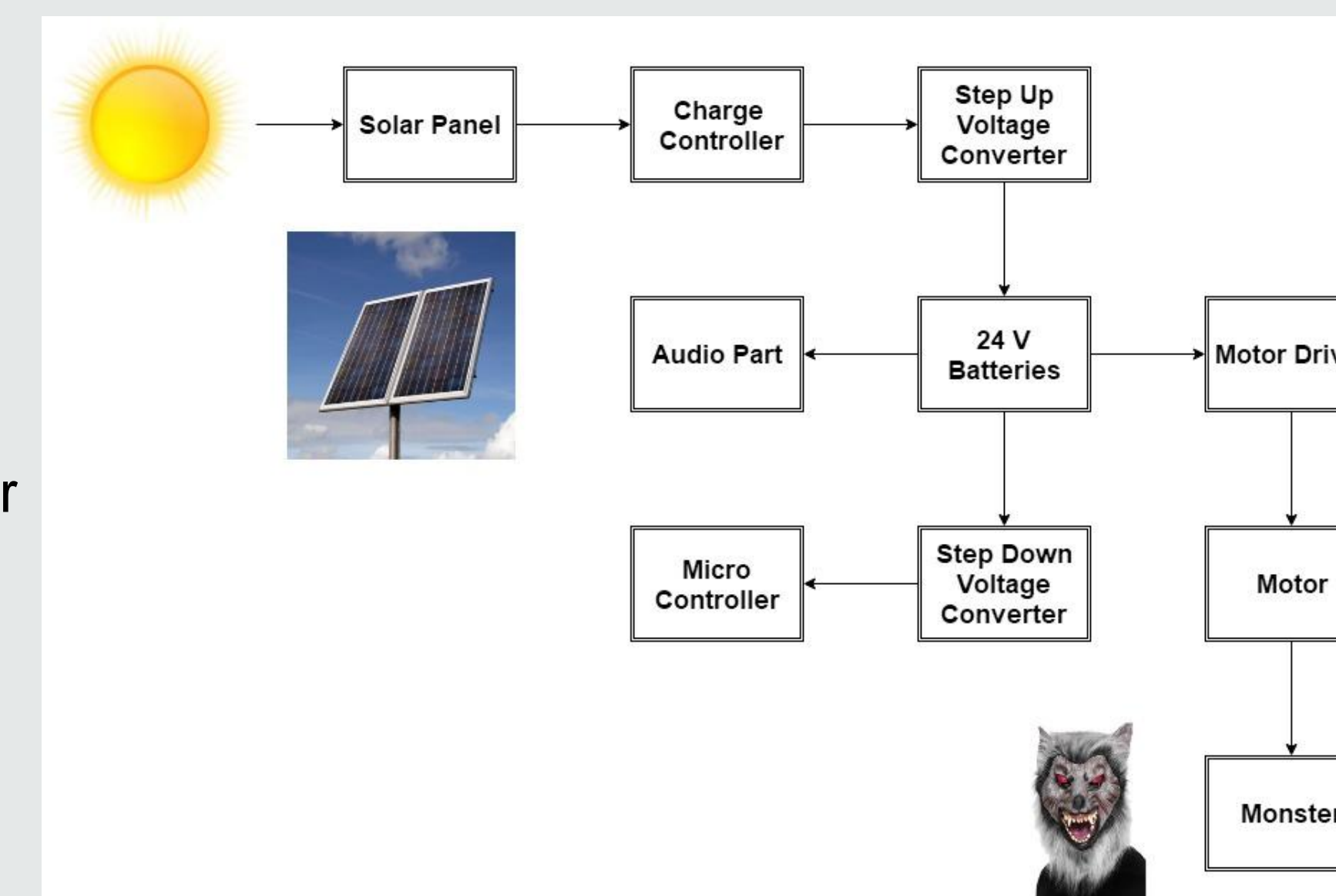
## Design Specifications

1. Motion Sensor:

ATMEGA328PU  
Microcontroller

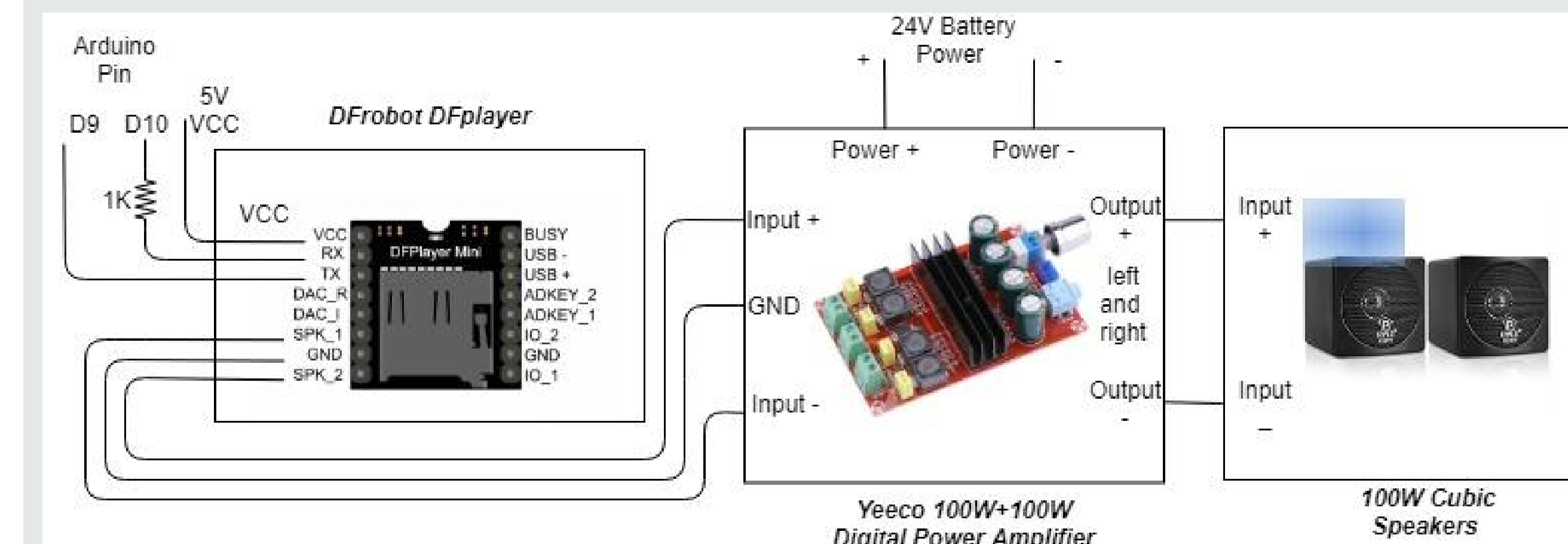


3. Solar Panel System:



Battery Charger Connected to 3.7 Li-ion Battery And 5.5V Solar Panel

2. Audio Part:



## Testing and Results

Motion Sensor:

- Wireless Range of 12+ meters in ideal conditions (outdoors)
- Motion detection angle of 290 degrees with small blind spots between sensors.
- Motion detection range of 12+ meters dependent on target speed and size.
- Battery life of 6 days on full charge.
- Battery recharge time of 15 hours in ideal conditions.

Audio Part:

- Loud and clear without noise.
- Volume is adjustable and maximum volume reach the requirement.
- Scary sounds can be replaced and stored to the TF card easily.

Solar Panel System:

- Waterproof.
- Voltage comes from solar panel is sufficient to charge batteries.

Motor/Monster

- The Driver is hooked up directly to the batteries for power, and to the micro controller for logic input
- When motion is detected, the motor rotates and the monster pops up, it then resets back to normal

## Conclusion

In conclusion the project functions as intended. All of the individual components work, and we were able to integrate them together without any issues.

The motion sensor is able to detect movement at the specified distance and send a signal to the main system. The main system can then react to this by playing a scary noise and causing the monster to pop-up.

The entire system is solar powered, and the energy is stored in the batteries. This will allow the design to function for an extended period of time off the grid.

## Future Work

The current design is adequate to cover all initial design goals, however Mr. Woolsey has goals of eventually bringing this product to market. In order for this product to be sellable, more work will need to be done. This includes:

- Testing the product in a deer dense area to prove its efficacy at deterring deer.
- Designing a more professional casing for the main components and monster.
- Testing the waterproofing to meet any related professional standards (IP65, etc.)

## References

- Atmel, "8-bit AVR Microcontroller with 32K Bytes In-System Programmable Flash", ATMEGA328PU datasheet, January 2015
- Texas Instruments, "TL07xx Low-Noise JFET-Input Operational Amplifiers", TL074CN Datasheet, September 1978