

ECE 480 Application Note Assignment

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Abstract

Our design team's project is Early Warning Sensing for Solar Power, and it mainly include two side of skills which we are using --- Computer Science & Electronic Engineering. So base on those two field, there are lots of ways (apps) can extend or refine our project's cover area, and personally, I think the most possible and relevant applications is the weather prediction, more specifically, nature disaster early warning.

Issue to Solve

Millions of people are affected by natural disasters every year, and the impact can be calamitous. From the destruction of buildings to the spread of disease, natural disasters can devastate entire countries overnight. Tsunamis, earthquakes and typhoons do not just wreak havoc on land; they also disrupt people's lives, especially for those living in remote regions. And under most cases, these disasters are coming unknowingly to country citizens, or unprepared well for people. For example, the earthquake, until today, there is no such an effective way to early warning earthquake, at least not leaving enough time for people to prepare. So I am thinking that using our project's technique to help people to

earn valuable time before disaster coming, even seconds of advance warning can allow people and systems to take actions to protect life and property from destructive disaster.

Ideas

Right now we are using light sensors to detect cloudy cover area and based on the threshold we set to send the warning. However, if our team has enough support (such as access to more precise data from local weather station or NASA, and capable to having more devices, enough money, etc.), there will be a way that theoretically predict the disaster.

1. Sensor

So right now we are only using light sensor to detect, they are good for demo so far, but it is suspect that whether it is useful or not when the detecting object is far away, such as the real world cloud. So a better quality light sensor is my first consideration. However, only based on light sensor is not enough, I would like to add more different type of sensors, such as inferred sensors, distance sensors, wet degree sensors and so on. It would be definitely better that finding a sensor has all

these useful functions, and the goal is obviously to gain more natural data for analysis and future prediction. Since sensor's size is really small and actually all the detecting part is essentially a resistor (could be others), so I think we can integrate these detecting resistors into one board to save the space.

2. Microcontroller(Signal sender)

After gaining all these data from sensor, these data going through the wired to the microcontroller. However, if some of the sensors' position are really far away to the microcontroller and other sensors, there will be trouble of communication between sensors and microcontroller.

Thus, I would add a small signal sender to the sensor, since there is not much signal to process per sensor, the signal sender is not necessary to be very big, such as CC1100 Wireless Module UHF Sender Receiver Data Arduino DIY P, the sensor will wired to the signal sender, and the sender will communicate with the microcontroller, and it is cheap, only few dollars per module, which is a way to solve the communication problem. Thus, people can put the sensor in any position they want, even deep down in earth, and they do not need to buy super long wires.

3. Camera

The reason that I mention camera is because real world picture is super useful when doing analysis and prediction. Like I mentioned before, if we can get enough support, I suggest that to get the picture from underground to near ground to satellite. And the usage of them is comparing with the data get from sensor to see if the situation analyzed mistakenly, for example, if a bird fly over a light sensor, the sensor will be triggered, but there should not be a warning message. Also, if we can get picture from underground, see if there is a gap occurs, to predict the movement of the lithosphere, and even more, to see the possibility of earthquake.

So let's take an example of tornado early warning, I think we should have light sensor, wet degree sensor and picture from camera (Satellite is better). Once the light sensor detect that there are multiple direction of coming cloud (Because cloud usually coming in one way, unless there is a un-normal activity such as tornado, and we already successfully implement direction function), and the wet

degree start to drop, combine with the real time picture, if there is really a tornado is forming, then the sensor will sent the data to microcontroller, and the microcontroller will sent message to the MSU weather station, and using our software, the computer will sent a warning to people, which can help them gain more time to prepared for the coming disaster.

Summary

So there are lots of way to detect different object by many different types' detection devices, however, how to combine them as a whole part is very important for the earning warning. Tornado warning example is only one aspect of usage of our project, and there are much more space to develop into many other field. Ultimately, if we succeed, I will be very happy that our project can saving lives and doing good thing to the world.