Korean Square Summer Program Projects 2021

1. IoT wireless emergency systems
    a. Much of the United States is still considered wilderness and does not have cellular coverage. However, much of this area is used for recreation and competitive events. The project will involve devising a system that allows for monitoring of, and communicating with people at large-scale events that may not have existing coverage.
2. IoT Agriculture and Greenhouse systems
    a. Agriculture continues to be one of the key areas of focus for the Internet of Things. Allowing for increased crop production more efficiently, with less human interaction and labor, will be the goal of a system built for crop production either in traditional agricultural fields or in a greenhouse environment.
3. IoT Farm Video Security system
    a. Many of the farms in the United States are at remote locations, with low bandwidth Internet connectivity. Yet there are always issues with crime and vandalism, especially as remote locations install solar, wind, and other power sources for IoT. The project will entail designing a system to monitor high-value items that may be miles away from the nearest residence.
4. IoT Farm Energy Management (Solar) system
    a. One of the challenges with using Solar and Wind power for IoT systems at remote locations is being able to monitor the health of the power systems themselves. The project will look at how to interact and maintain alternate energy sources from many miles away.
5. IoT Forestry Monitoring
    a. Forestry is a critical industry in the U.S. and around the world. Monitoring the health of forests can be a huge challenge, as many are in remote locations and require specific radio networks to penetrate the foliage and pass data to towers that may be many miles away. This project will investigate methods to gather data from sensors in a tree farm using a combination of drones and LoRa communications.
6. Red Light Running System
    a. Accidents based on vehicles failing to stop for red lights cause thousands of injuries and hundreds of deaths every year in the U.S. alone, and many more worldwide. Yet there is no effective method for alleviating this problem currently implemented on a large scale. The project will investigate possible solutions to identify when a driver is about to run a red light, how to notify them, and how to warn other drivers and pedestrians in the area.
7. Build an IoT Platform from scratch
    a. Large-scale IoT is often based on cloud providers such as Amazon, Microsoft, and Google. Though their IoT platforms include the tools to make handling the processes easier, they are often expensive and are difficult to predict the costs for a small IoT implementation. This project will look at the IoT ecosystem and investigate building a system to handle all of the different basic IoT functions, including data storage, analytics, etc.

8. IoT Solar powered weather monitoring
    a. Micro-climatology has become an important tool for agriculture worldwide. There is a huge push to put as many weather monitoring stations as possible throughout the agricultural areas of the U.S. and most countries. Though many commercial units are available, building a unit consisting of sensors and communications systems is a valuable learning experience and covers almost all facets of IoT.
9. IoT Beacon-based system for safety, monitoring, or advertising
    a. Bluetooth and Wi-Fi beacons can be used for a host of different applications in manufacturing, retail, and many other market segments. This project will pick an application and design and implement a beacon system to solve a common problem.
10. IoT Personal Health monitoring system
    a. Many companies are looking at personal health monitoring, whether for medical needs like diabetes, athletics, monitoring of the elderly, and many other uses. This project will look at designing and building a basic system to help monitor and gather data on one of these health challenges.
11. IoT RFID security system
    a. Radio Frequency Identification is an older technology that has had something of a rebirth with the recent explosion of IoT. This project will look at the use of RFID for security purposes and build a basic security system based on the technology integrated with IoT.
12. IoT Air Quality and/or Environmental system
    a. Air and water quality, in addition to other environmental factor monitoring, is an important technology for both urban and rural areas. This project will entail building a system to monitor several of the factors that influence the health and well-being of humans and their environment.
13. IoT COVID-counter for room or lab access
    a. Many Universities face the dilemma of having to enforce rules and regulations for the number of students that are allowed in a laboratory or classroom environment during the COVID crisis. Most schools will have to deal with these issues on an ongoing basis for many years to come as it becomes obvious that keeping people healthy indoors revolves around the population in a given area and the social distancing of those people. This project will address the technologies that might be used to regulate and enforce pandemic-based rules using an IoT system.
14. IoT Parking management system
    a. Parking is a worldwide issue, whether on university campuses or in congested urban areas. Parking garages and lots are expensive and utilize large spaces that could be used much more effectively and profitably for both private companies and municipalities. This project will look at using an IoT system to maximize the efficiency of parking areas, benefitting drivers, companies, and municipalities.
15. IoT for Disabilities assistance
    a. Technology can change the lives of people with disabilities. This project will investigate ideas to benefit those people, as well as building a working prototype.

16. UAV ground scanning systems to find people or groups
    a. The ability to find and track entities on the ground from a small, class 1 UAV has many applications in safety, security, defense and agriculture. In this project, we will design ways to find and track a group of humans from a low flight level. The main application will be for finding people in low light or dark conditions using infrared or thermal imaging.
17. UAV ground detection and tracking systems
    a. Often a forest of trees has many different kinds of trees. In this project, we want to design a novel way to fly over a tree and determine what kind if tree it is, using a visual or biological sensor. Then, record the GPS point on the tree. At the end of a flight a map will show all of the GPS points for the specific variety of tree.
18. Acoustic node detection for UAV's
    a. UAV's have started become intrusive to many areas of civilian life, often intruding or effecting criminal or terroristic behaviors. In this project, we will examine how to develop low cost acoustic nodes to detect and alert about incoming UAV.
    b. A second area of this project is how to network these acoustic nodes together to create a defensive net around a physical space. This acts as a protective net around buildings, human gatherings or critical infrastructure, such as a nuclear power plant.
19. GPS systems for farm equipment using novel radio
    a. Older farm equipment does not typically have any sensors or electronics. But there are many millions of old farm implements in use today. This project develops a way to create GPS systems for older equipment to connect to a base station and show where the equipment has been and what ground it has covered. Older equipment is normally simpler so this could lead to simplified autonomous applications in agriculture.