

ASSIGNMENT 1

NAME: Tattukolla satyakumar

EMAIL: satya.18bec7113@vitap.ac.in

Smart Cities

Kay Sharpington from Gartner, states “The COVID-19 pandemic is slowing down spending, however, governments across the globe continue to use IoT technologies and solutions to improve citizen safety. At the same time, the falling endpoint and connectivity costs make smart city initiatives more viable”. Gartner estimates that the global government Internet of Things (IoT) endpoint electronics and communications market will total \$15 billion in 2020, an increase of 6% from 2019. Same study also reveals top 5 government IoT applications and revenue generated by each use case as seen below:

Outdoor surveillance

When IoT CCTV cameras combined with artificial intelligence and machine vision, governments can automate surveillance of streets through cameras. As IoT enables connectivity of machines, they are able to record and analyse video data in real time, and they can provide police officers with insights instead of single pieces of images.

However, outdoor surveillance processes personal information and there is potential for abuse in use of such technologies. Therefore appropriate

checks and balances need to be implemented in such systems to ensure that personal information is not abused while risk of crime is minimized.

Smart lighting

Smart lighting is the fourth-most mature IoT tech application. Smart lighting aims to optimize energy management.

Smart lighting is made up of street lighting with IoT sensors. Sensors collect data about the condition of traffic and pedestrians. With that data, street lights provide optimum lighting so that street lighting systems can save up to 80% of the energy.

Smart lighting can also be applied to factories or homes.

Electronic Road Toll Collection and Traffic Management

Traffic engineers augmented by smart systems at a central traffic management center (TMC) can analyze data from IoT sensors then optimize timing of traffic lights throughout the day. This can help divide the traffic more evenly over roads as traffic volume fluctuates.

Smart parking

In cities like San Francisco, parking is a big problem. With IoT sensors, parking problems in a city can be minimized.

Noise Monitoring

In smart cities, sound monitoring systems can monitor noise levels and warn companies that violate limits and help manage noise levels.

Structural Health Monitoring

IoT allows remote collection of architectural data to monitor events such as vibrations and changes in material conditions, predict structural damage, and prepare action plans for structures such as bridges, buildings, stadiums, ships, airplanes, etc.

Waste Management

Traditional waste collections are complicated and costly since a fleet of trucks drives along busy streets using inefficient routes. Fill levels of garbage containers differ for each container: ranging from overflowing, partially filled and empty. IoT sensors can monitor fill levels for conventional bins and send the data to the relevant department of the city hall. With that information, the garbage truck routes can be optimized for trash collection.

Machine learning methods can also be implemented in IoT sensors so that sensors can predict the fill levels of containers by learning from historical data.

Below the video, you can find how Proximus, an IoT solutions vendor, using IoT to manage waste:

Water Management

Due to the drastic increase in urbanization levels and the importance of water quality in human health, water management is a key topic for cities. A water management system is based on real-time data collected from sensors. Water management can provide the following applications:

Water conservation

Sensors detect the water level in tanks and alerts when the water level is lower than the threshold.

Smart Irrigation

IoT sensors determine the weather condition and the soil moisture, which will help in getting the appropriate amount of water that soil needs.

Leakage Management

IoT sensors can detect temperature changes, water leakage, chemical leakage, and pressure level in water tanks.

Water Quality Management

IoT sensors determine what kind of chemicals are in the water. They also identify metrics such as total dissolved solids (TDS), bacteria, chlorine, electrical conductivity, etc.

Ultraviolet Radiation Monitoring

Ultraviolet (UV) rays are electromagnetic waves that account for about 10 % of solar light. When overexposed, UV rays have harmful effects such as skin cancer, premature aging, cataracts, and immune system suppression. IoT sensors measure UV sun rays to warn people not to be exposed in certain hours.

Fall Detection

Falling into the ground and not being able to get up or request help can be a scary experience for senior citizens. IoT sensors can detect falls using geolocation data and summon help so that it reduces the time the elderly remain on the floor after a fall which could lead to lethal consequences.

Companion Robots

A companion robot is a robot that is designed to create companionship mostly for elderly and single children. IoT sensors are essential for robotics and it is the same for companion robots as well. Sensors detect objects that surround the robot and enable the robot to move.

Researchers claim that people have become more receptive to companion robots during the pandemic. Social isolation may lead people to loneliness, anxiety and frustration, especially for the elderly.

Medical Fridges

Medical fridges monitor the temperature of vaccines, medicines and organic elements for clinics and health centers. Medical fridges provide an opportunity to follow all safety standards and national regulations of the pharmaceutical market using IoT sensors. They prevent medicines and vaccines from spoiling.

Efento is an IoT sensor and IoT platform vendor that has a variety of temperature measurement products along with wireless monitoring of temperature in medical refrigerators.

Patient Surveillance/Remote Patient Monitoring

20% of patients who had surgery are readmitted to the hospital within just 30 days. Remote patient monitoring (RPM) systems use wearables to monitor the condition of patients who are resting at home after surgery. RPM enables real-time data collection about patients' body temperature which is the main indicator of infections. With RPM, doctors

can observe patients' data and provide early diagnoses without requiring patients to be physically present at the hospital.

Supply Chain Control

IoT devices have transformed supply chain management. Sensors, which are attached to storage containers or to products themselves,

- show the location of goods using GPS,
- track the speed of movement providing an accurate estimated time of arrival (ETA) for goods,
- monitor warehouse conditions such as temperature, humidity, light intensity, and other environmental factors

Near Field Communication (NFC) Payment

NFC enables contactless payments. POS vendors include NFC support in their systems, and customers are adopting contactless payments via their smartphones.

Layout Optimization

Sensors in the store collect data like voice, image or video to better understand customer habits and preferences. Retailers can get insights to redesign the layout of their stores. The optimized layout can enhance sales.

