Environmental Impact

Intelligent Systems

Learning Intentions

By the end of this lesson you will be able to:

Describe the environmental impact of intelligent systems:

- ❑ Heating systems
- ❑ Traffic control
- ❑ Car management systems

What is an intelligent system

There are a huge variety of Intelligent systems in use today:

- Self-driving vehicles
- Rescue robots
- Domestic appliances to digital assistants

These systems gather data from their surroundings:

- **without** human interaction
- **automatically act** on that information,
- enabling benefits such as faster responses in crisis situations
- allowing more **efficient resource management**
- safer performance of difficult tasks

Heating Systems

Smart heating systems use a variety of ways to control the amount of heat required in our homes.

- Using activity sensors, some smart systems **learn** the temperatures that you prefer in certain rooms and at what times.
- Monitoring the activity in rooms can mean that the system adjusts the heating up or down depending on whether there is unusual activity in the house.

Heating Systems (cont)

The thermostat is usually connected to wi-fi and can be manually controlled by using an app on your phone

This allows you to turn the heating system off if you are not going home or to turn it on so that it is at the optimum temperature if you are coming home early.

- Some can use geolocation to turn the heating on or off when you are coming home or leaving

Vehicles and the Environment

Vehicles are considered one of the main contributing sources of greenhouse gas.

Studies in the European Union showed that transport causes 25% of all carbon dioxide emissions.

Vehicles consume greater amounts of fuel when they are constantly accelerating and braking in traffic jams.

- The optimum speed for low fuel consumption and low emissions is **between 45 and 65 miles per hour.**

Traffic Control

How have we reduced carbon footprint from vehicles historically?

1. fuel economy has been increased
2. using less carbon-intensive fuels (e.g. electricity, hybrid);
3. managing travel demand (e.g. congestion charges)

Intelligent Traffic Systems can be applied to improve the efficiencies of traffic system operations, thereby reducing overall Greenhouse gas emissions.

Traffic Control (cont)

What can intelligent systems do for traffic management?

With the increases in hardware such as:

- Radar/LiDAR
- Computer vision technology

Traffic Monitoring Systems can provide better real-time information, and software can be used to estimate traffic flow, density, and speed.

This information can be used for better traffic system management

- For individual drivers choosing alternative routes, resulting in a reduction of congestion. GPS auto-routing based on congestion

Managing Incidents

Traffic Incident Management techniques are important tools in terms of early detection and rapid removal of incidents (i.e., accidents, disabled vehicles, etc.) so that normal traffic operations recover as quickly as possible.

Alternative routes would also have to be considered to prevent simply moving the congestion from one site to another

Further Reading: https://link.springer.com/article/10.1007/s40518-015-0032-y

Car Management Systems

Start-stop systems automatically shut down the engine when the car is not moving

- ❑ reduces the amount of time the engine spends idling, reducing fuel consumption and emissions.
- ❑ The engine automatically restarts when the clutch is pressed,
- ❑ most advantageous for vehicles that spend significant amounts of time waiting at traffic lights or frequently come to a stop in traffic jams.

Engine control units (ECU's) use sensors to ensure the engine's air/fuel ratio can be controlled accurately

- ❑ ensuring optimum fuel consumption
- ❑ reduction of carbon dioxide emissions