Topic 7

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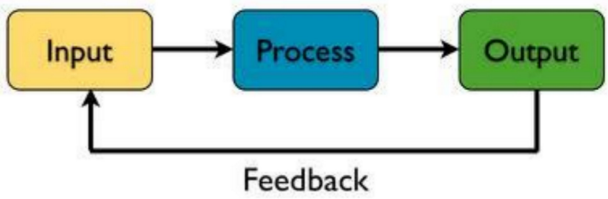
7.1.1 Discuss a range of control systems
Automated doors, heating systems, taxi meters, elevators, washing machines, process control, device drives, GPS systems, traffic lights

A control system is a device, or set of devices, that manages, commands, directs or regulates the behavior of other devices or systems

7.1.2 Outline the uses of microprocessors and sensor input in control systems
Microprocessor: an integrated circuit that contains all the functions of a central processing unit of a computer
Sensor: a device which detects or measures a physical property and records, indicates, or otherwise responds to it.

7.1.3 Evaluate different input devices for the collection of data in specified situations

7.1.4 Explain the relationship between a sensor, the processor and an output transducer
Simplistically, sensors take analogue input and convert them to digital data.
Digital data can then be processed by a microprocessor, producing digital output.
Output transducers can then turn the digital data into analogue signals to power 'real world' devices.



Input = sensor (via transducer)
Output = actuator (via transducer)

7.1.5 Describe the role of feedback in a control system
Feedback is the modification or control of a process or system by its results or effects, for example in a fridge the thermometer provides feedback to the sensor that switches the refrigeration system on/off.

7.1.6 Discuss the social impacts and ethical considerations associated with the use of embedded systems
Social issue
- A social issue is a problem that influences a considerable number of the individuals within a society.

Ethical issue
- A problem or situation that requires a person or organization to choose between alternatives that must be evaluated as right (ethical) or wrong (unethical).

Surveillance
Arguments for: • Allows for greater security • Could be used as effective evidence in court cases • Allows fewer people to have monitor others
Arguments against: • Loss of privacy • Could be hacked and used for unintended purposes • Could be used to spy on people (drones)

Tagging prisoners
Arguments for: • Allows non-dangerous criminals to move • Reduces number of people needed to be in prison • Allows for tracking at all times
Arguments against: • Loss of freedom of movement • Could possible be hacked to track innocent people • Tracking data could be sold off to make money

7.1.7 Compare a centrally controlled system with a distributed system
Centralized system: is computing done at a central location, using terminals that are attached to a central computer. The computer itself may control all the peripherals directly (if they are physically connected to the central computer), or they may be attached via a terminal.

Distributed system: is a system in which components located on networked computers communicate and coordinate their actions by passing messages. The components interact with each other in order to achieve a common goal.

Advantages of centrally controlled system:
- Easier to administrate
- More control

Advantages of distributed systems:
- Quicker access
- Shared load
- Response more specific to environment

Disadvantages of centrally controlled system:
- If the main sensor/controller fails, the whole system fails

Disadvantages of distributed systems:
- Much more expensive to have multiple controllers/sensors
- Much more complex than a centralized system

7.1.8 Outline the role of autonomous agents acting within a larger system
Definition: Autonomous agent
Intelligent agents are software entities that carry out some set of operations on behalf of a user or another program with some degree of independence or autonomy, and in so doing, employ some knowledge or representation of the user's goals or desires (IBM definition)

<u>Features of Autonomous agent</u>

A. Autonomy : select the task themselves
B. Reactive behavior: Agent senses the environment in which it is and decides what to do, reacting on its perceptions

C. Concurrency/sociality : Agents can interact with other agents through communication, in different modes: coordination, cooperation and competition.
D. Persistence : The code describing an agent runs continuously like a process, and it not executed on demand.

Questions:
The process of the use of sensor

1. Sensors activate
2. Signal sent to processor
3. Which sends signal to actuator

Define interrupt

1. A signal sent to the processor
2. Sent by hardware or software
3. Indicating an event that needs the processor's immediate attention