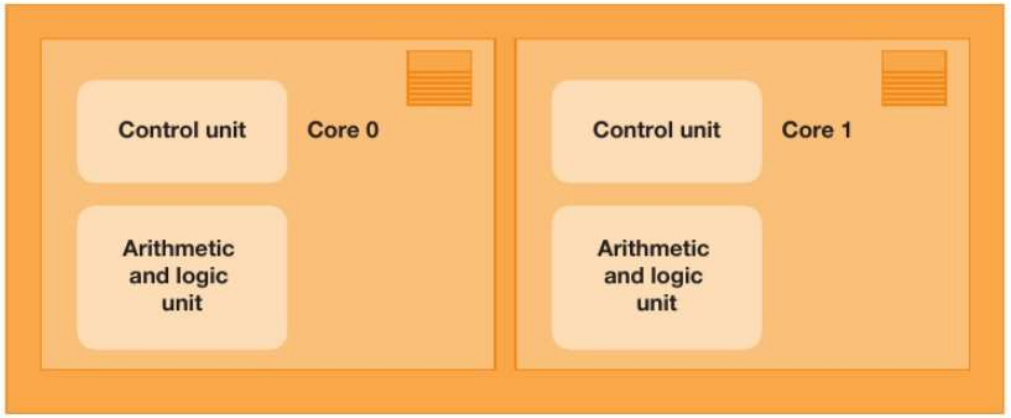
# 3.1 COMPUTER ARCHITECTURE

- Clock speed
  - The faster the clock speed, the faster the rate of processing
  - The more clock speed, the faster the instructions will be processed
  - Higher clock speed, higher heat generated. Need of cooling system
- Number of cores
  - Modern processors, have multiple cores
  - Multicore processors
    - Same program – two or more working on the same process (parallel processing)
    - Different program - multitasking



# QUESTION

Complete the table to show the effect on a computer system of increasing the width of a bus.

(2)

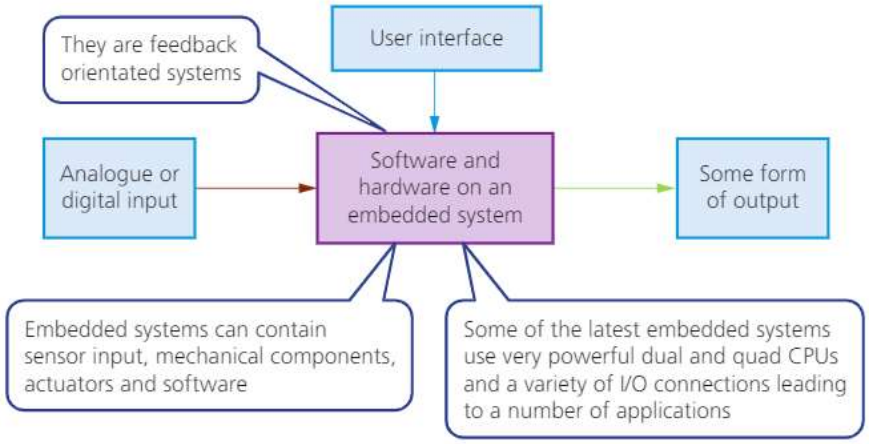
| Change made | Effect |
| --- | --- |
| Increasing the width of the data bus | |
| Increasing the width of the address bus | |

# 3.1 EMBEDDED SYSTEMS

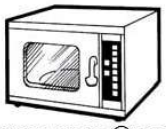
- An embedded computer system is a computer system that designed to do a specific task e.g. PS5, robot vacuum or self check-out in a supermarket
- Embedded computers are usually cheaper than general-purpose computers (PC, laptop) because they only need hardware that can perform specific tasks e.g. robot vacuum cleaner doesn't need big RAM to work

# 3.1 EMBEDDED SYSTEMS

- Embedded systems require some input hardware to enter data into the system e.g. microphone, sensor, button etc
- Microprocessors are used to process input data and send the result to output hardware e.g. actuator, speaker, motor, light, valve etc.
- Modern embedded systems can be accessed and controlled remotely via the internet. This is called 'internet of things' (IoT) e.g. Apple Watch, automatic gate, air-conditioner




Photocopiers



Microwave Ovens

# 3.1 EMBEDDED SYSTEMS

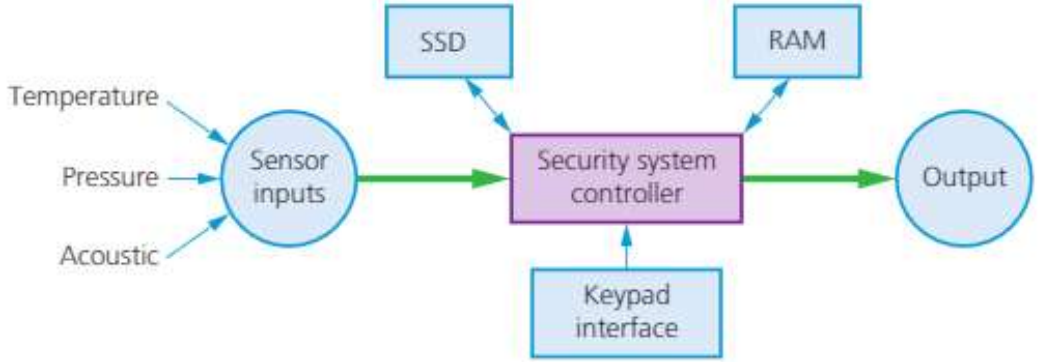
| Benefits | Drawback |
| --- | --- |
| Small size : easy to fit into small area, easy to carry around | Difficult to upgrade.<br>Buy a need version instead |
| They are relatively low cost | Difficult to get fixed because it need specific tools and parts |
| Consume less power than general purpose computer | Increase electronic waste since it is difficult to get fixed or upgraded |
| Can be controlled remotely using internet (iot) | iot devices have security risks e.g. hacking, virus |
| | |

# 3.1 EMBEDDED SYSTEMS

- 4 Cs for examination
  - Collect : the sensor (pressure) collect current pressure value from the environment and send to the microprocessor
  - Convert : the data from the sensor must be converted to digital data using ADC
  - Compare : the input data (pressure value) will be compared with the preset value. If the pressure value exceeds the present value, the microprocessor send signal to output (alarm, or mobile phone)
  - Continue: these processes are continued

Security systems

Embedded systems are used in many security devices:



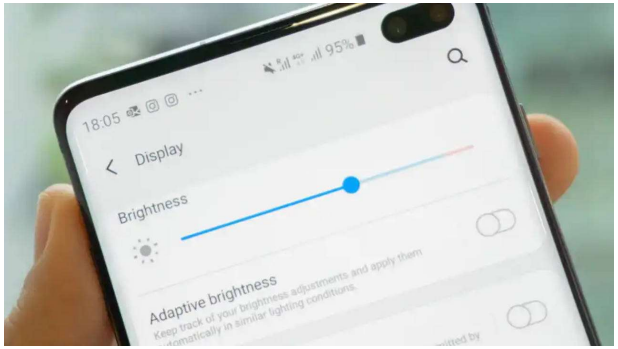

▲ **Figure 3.9** Embedded system found in a security system

# QUESTION

Street lighting is controlled automatically. A light sensor and a microprocessor are used to decide when to switch each street light on or off.

Describe how the sensor, microprocessor and light interact to switch the street light on or off.

# QUESTION




The LCD (liquid crystal display) on the mobile phone is back-lit using blue LEDs (light emitting diodes). The brightness of the mobile screen is determined by the level of light in the room. The amount of light given out by the LEDs is controlled by a control circuit.

Describe how the sensor, microprocessor and LEDs are used to maintain the correct brightness of the mobile screen

# QUESTION

A security system uses sensors, a camera and a microprocessor to capture images of each person entering a sport stadium.

Describe how the sensors, camera and microprocessor interact to identify certain people entering the stadium.