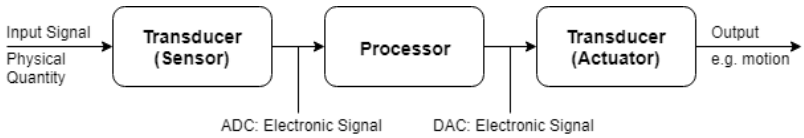
Relationship Between A Sensor, Processor, Output Transducer

A *processor* receives input, in electrical form, from sensors and then performs some sort of output.

Transducers convert one form of energy to another. Transducers convert physical quantities into electrical signals and vice versa. This conversion process from one form of energy to another is called **transduction**.

Sensors can be transducers, as they sense a physical quantity and transform it into another form of energy. Other devices can also be transducers.

Actuators are transducers that receive some form of energy and convert it into motion. Actuators are devices responsible for moving some kind of mechanism. Control systems use actuators to perform some actions in an environment.



The above diagram is how a control system works as an input, process and output device. An input signal is recorded by a sensor, which transforms the physical quantity an electrical signal. The sensor is a *transducer*, because it converts one form of energy to another. The electrical signal is then converted nto an electronic signal with an analogue-to-digital (ADC), so that it can be processed by the processor. After the processor does the necessary processing, it outputs an electronic signal. This is then converted into an electrical signal, using a digital-to-analogue converter (DAC), so that it can be input into the actuator. The actuator will convert the electrical signal into motion. The actuator is a *transducer*, because it convers one form of energy to another.

Social Impacts and Ethical Considerations

Electronic Tagging
Electronic monitoring devices can "tag" offenders that have been found gulty of minor offences, inmates that are entitled to leave time, or individuals under house arrest. Overcrowding of correctional facilities impacts their ability to provie effective rehabiliation. Minor offences can be efficiently dealt with prisoner tagging. The GPS allows correctional officers to monitor their location at all times. Tampering with the device or trying to remove it raises an alarm.

Benefits:
- Reduces crime rates as offenders are less likely to reoffend
- Makes police officers solve crimes faster, which saves the time of court rooms and lawyers
- Saves prison cells and there is less need for creationg more correctional facilities
- Could improve rehiabilitation and reintegration of offenders, as they are leaving correctional facilities sooner
- Has multiple uses on people with memory loss and immigrants

Limitations:
- Might not be a severe enough punishment for the criminal
- Does not physically restrain offenders from commiting more crimes
- Needs a large task force of individuals that can monitor criminals and intervene when necessary
- Wearing the tag may add psychological pressure to the wearer

Surveillance, CCTV
CCTV cameras are everywhere, on highways and cities around the world. CCTV cameras are on top of traffic lights, near intersections, in parks, outside shops and more. People don't often notice their exitence. Recent advancements have enabled CCTV systems to use algorithms for facial recognition, as well as license plate recognition, to locate and follow a target. Most forms of electronic surveillance systems are embedded control systems.

Benefits:
- The knowledge of being watched, in general, reduces the temptation to perform illegal acts (e.g. drivers will follow the road rules).

Issues:
- Loss of privacy if an area has too many cameras
- Misuse of information gained from CCTV cameras
- Whether surveillance is actually effective in reducing crime
- Whether workplcaes should install surveillance to monitor their workers.
- Whether schools should install surveillance to monitor students and teachers.
- Whether the right to privacy is more important than preventing potential crimes.

Improved Safety Systems
Safety systems are put in place to avoid unfortunate events. Everyday life is full of unexpected events, and so safety systems improve in order to anticipate them as much as possible.

An example of a safety system in an elevator - too many people may be in an elevator. A warning light comes on and the elevator does not move until enough people have left.

Safety systems are upgraded and improved when they are used but fail for some reason.