My Digital Career
Paulo de Souza

Professor Paulo de Souza is the Head of the School of Information and Communication Technology at Griffith University. Paulo's research interests lie in micro-sensing and exploring applications of his sensors across different fields of science and industry. He contributed to the design, production, deployment, and operation of a sensor used by NASA onboard two rovers on Mars. Paulo has also worked on Bees with Backpacks and the SenseT Program.

Part 1 – Remote Work

Context:

Robots are able to do jobs that are too dangerous, too expensive or just impossible for humans to do. Exploration is an important job for robots, because the places being explored are often too dangerous or too expensive to send humans. They can be our eyes and ears in faraway places.

Question:

List three places that you can think of which would be best explored using robots and why robots would be appropriate for that job:

Place	Reason robots would be appropriate

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Part 2 – Sensors and Movement

Context:

Robots perceive the world by gathering data using their sensors, similar to the way we use our senses to tell us about the world. Robots have sensors installed on them to gather data for multiple reasons. Some sensors are used by the robot to help them understand the world around them and move around safely. Sensors can be used to detect a wide range of things, including:

| light levels | colours | magnetic fields | touch | distance to objects |

| sounds | force | images | movement speed | location | temperature |

Question:

What are some of the hazards around the room that a robot would need to be able to detect so it could move around safely? Consider a robot about the size of a human.

List of hazards:

Question:

Pick one of the three places you listed earlier in Part 1. What hazards would your robot need to be able to detect so that it can explore that place safely?

List of hazards:

Question:

What kind of sensors could your robot use to detect the hazards you listed and move safely around them?

Sensor list:

Question:

Robots need to be programmed so that they can respond to their environment without humans assisting them. Write three rules for your robot, linking the things that your sensor detects to actions the robot needs to take.

For example, if the robot detects temperatures over 100 degrees Celsius ahead, then it should move backwards, away from the source of heat.

Sensor list:

If the sensor detects...	**Then** the robot should...

Context:

In addition to using sensors to help robots make decisions, sensors can be used to gather data to tell us about the places that robots are exploring. The sensors that Paulo designed are part of a robot that is being used to learn new things about Mars. Sensors are often used in science because they can detect and measure things more accurately than human senses.

Question:

Circle the things that you think computerised sensors can measure more accurately than human senses:

temperature

time

distance travelled

emotions

colours

fabric texture

taste

Question:

Consider the places you listed in the first question. What would you want your robot to be able to tell you about those places? List one sensor for each of the three places you listed and describe the kind of data you would want it to collect. If your robot is conducting scientific research, what do you want to learn? If it has a job to do, how will you know if the job is done?

For example, you might want to know about temperature changes as your robot reaches the surface of a planet.

List of data to gather:

Place	Sensor used	Data gathered

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