

# 7.8 PRACTICAL SKILLS AND PROJECT — Robots

## Precheck

Before you start, have you completed the following units?

- 7.2 Types, purpose and uses of robots
- 7.3 Function of robots

The practical skills activity, *Robot arms*, and project, *Mars robot explorer*, are virtual, using resources on the World Wide Web. The weblinks and instruction sheets for these activities can be accessed through jaconline.

Software requirements for Practical skills — *Robot arms*

- **Basic controls** — a web browser with standard VRML (virtual reality markup language) built in. All recent web browsers have this feature (very early or non-standard browsers may not). This activity will also work better if your browser has the CosmoPlayer plug-in which provides additional VRML features.
- **Advanced controls** — a web browser with the Java plug-in (not just JavaScript). The latest web browsers have this feature while, for older web browsers, you will need to download a free Java runtime program.



## On jaconline

Practical skills — *Robot arms*

- CosmoPlayer plug-in
- Robots in virtual manufacturing
- Java plug-in
- VRML robots

Project — *Mars robot explorer*

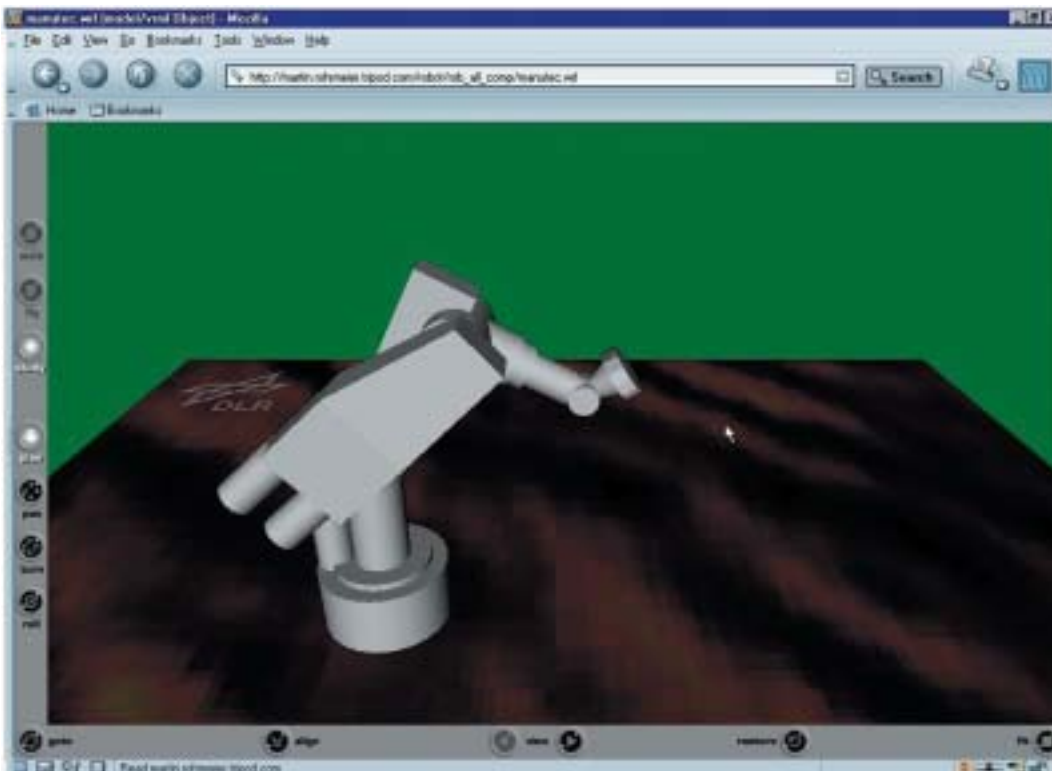
- ROVer Ranch

## Practical skills — *Robot arms*

### Basic controls

- Access the ‘Robots in virtual manufacturing’ website and scroll down to the *Robot Programming* section.
  - Click on the link to load the functional VRML 2.0 robot. VRML is a three-dimensional web interface built into most web browsers.
  - Use the control buttons below the robot to move each of the movable sections of the arm. Each degree of freedom is indicated by a different coloured section of the robot.

The ‘Robots in virtual manufacturing’ website also shows this robot working in some common manufacturing situations.



Screen 1 — VRML robot with basic motion controls



### Advanced controls

- Access the ‘VRML robots’ website and select one of the industrial robot models. (If you do not have CosmoPlayer installed as a plug-in for your web browser, you will be able to use only the basic browser version of each robot.)
- Control the movable arm sections of each robot by dragging them with the mouse.

### Project — Mars robot explorer

Access the ‘ROver Ranch’ website. Registration is required (it is free and instantaneous). Your teacher can create a class group and organise individual student logons.

After logging on, select the *Missions* and *Mars Explorations* options and then the *M600 mission* to build and operate your own Mars explorer rover. Other missions are available and are also suitable as projects. The mission is divided into a number of separate stages and you do not have to complete the entire mission in one go. You can save your work at any time and return to complete it later — your logon password will give you access to your saved work.



Screen 2 — VRML robot with advanced motion controls



Screen 3 — Navigating your rover to an objective

#### Step 1 Briefing

Read the briefing notes carefully. They will give you details of your mission.

#### Step 2 Build Bot

This will load a Java application that will allow you to select the necessary hardware devices for your mission and attach each to a suitable power source. You can then run a set of diagnostic tests

on your rover. You should also save the rover.

#### Step 3 Program Bot

You will need to program your rover by providing it with a path to each of its mission goals. It will also need instructions to control its different sensors and actuators. You should save your entered path and script.

#### Step 4 Run mission

This will run your mission using a 3-D interface. You will be able to see the success or failure of your rover design.

#### Step 5 Debriefing

The results of your mission and its data will be revealed.