TJ Robot WorkBook
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MANIFESTO

Mekatronix™ espouses the view that the personal autonomous agent will usher in a whole new industry, much like the personal computer industry before it, if modeled on the same beginning principles:
*   Low cost,
*   Wide availability,
*   Open architecture,
*   An open, enthusiastic, dynamic community of users sharing information.

Our corporate goal is to help create this new, exciting industry!

TALRIK JUNIOR, affectionately known

as TJ, is an excellent robot for introducing you to the exciting area of programmable, autonomous, mobile robots. *Programmable* means that TJ has a computer on board that allows you to change its behaviors. *Autonomous* indicates that TJ can act on its own without being directly controlled by a person. *Mobile*, of course, tells us that TJ can move around!

A completed TJ has a 7-inch radius and 3.5 inch height. He is constructed from beautiful, 5-ply model aircraft plywood and rides on wheels and a rear skid. Two gearhead motors mounted underneath the platform drive the wheels, one motor per wheel. The computer on TJ serves as the robot brain. TJ has very little memory: 256 bytes of RAM and 2 KBytes of EEPROM. You can also use other microprocessors in the TJ.

Most of TJ's electronics fit under a removable top plate that hinges in front and locks down in the back with a wooden key.   TJ possess two IR detectors and two IR emitter headlights in the front. An IR emitter taillight mounts in the back underneath the plate. A plastic bumper encircles TJ's waist. Four contact switches, three in front and one in back, allow TJ to detect front or back collisions.

You can add more sensors to TJ to help him detect more about his environment. Programming TJ requires additional hardware and a personal computer. A serial communication link allows the user to upload and download TJ data and programs from a PC. You can program TJ with a programming language called C or in the Assembly Language of the microprocessor.

7ᵗʰ Grade TJ Robot WorkBook

Biology of Robots

<table>
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You need:
    A TJ Robot
    Construction Paper
        White   Black
        Red   Yellow
        Blue   Green
    A Pencil
    This Worksheet

TJ EXPERIMENTS:

Experiment 1

If the robot bumps into something, what does it do?
_____

When you hold a piece of paper slightly to the **right** of the robot, what does it do?
Approximately how close to the paper does TJ get before it does this?

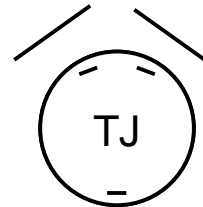| Color	Action	Approximate Distance
White		
Black		
Red		
Green		
Blue		
Yellow		
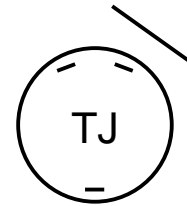
When you hold a piece of paper slightly to the **left** of the robot, what does it do? Approximately how close to the paper does TJ get before it does this?

Color	Action	Approximate Distance
White		
Black		
Red		
Green		
Blue		
Yellow		
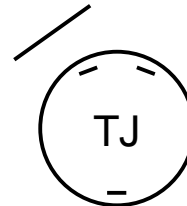
If you hold paper on both sides of the robot, what happens?
_____
_____

If you put two TJs facing each other, how do they react?
_____
_____
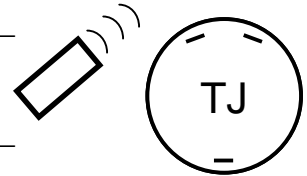
When TJ sees something to the **left**, it turns _____.
When TJ sees something to the **right**, it turns _____.

Experiment 2

If you aim the remote control at the floor a little bit in front of the robot and hold down a button, what does it do?

_____
_____
_____
_____
_____

If you aim the remote control directly at the robot's eyes and hold down a button, what does TJ do?

_____
_____
_____
_____

From how far away can you still affect the robot?

_____
_____
_____
_____

Experiment 3

Go to your robot teachers to reprogram your robot.

Plug the 6-wire cable into TJ's head. Switch the robot to **Download** mode, and turn the power on. Watch the lights on the communications board. One of them should flash every time you push the **RESET** button. If this does not happen, then the cable is plugged in backwards on the robot. Pull it out, turn it around and plug it in, then try again.

When the robot is plugged in correctly, type the commands listed below:

mscc11   code\race9
Push <ENTER> and follow the directions on the screen.

What happens to the lights on the communications board while the TJ is being programmed?

What do these lights mean? (HINT: Ask your robot teachers.)

Experiment 4

Aim the remote control on the ground in front of TJ and hold down a button. What does TJ do?

_____

Aim the remote control in front and to the left and right of TJ. What does TJ do?

_____

Try the same things using an Avoid robot instead of the remote control. What happens?

_____

Turn the TJ on and hold it in front of the camera. What do you see?

_____

Hold the remote control in front of the camera and press a button. What do you see?

_____

What do TJ and the remote control have in common?

_____