Autonomous Alarm Clock

User Guide

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INTRODUCTION

Welcome

Do you have problems waking up in the morning? Do you hit the snooze button and go back to bed? Are you late to class, work, or life in general?

The Autonomous Alarm Clock will fix your problems! This alarm clock will jump start your day by creatively stimulating you mentally and physically.

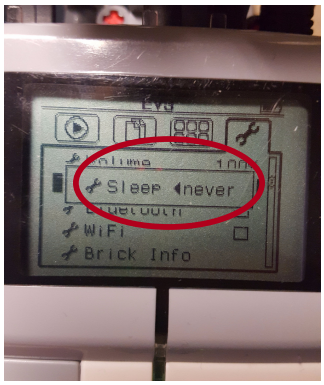
The program includes time settings for the current time and wake-up time. It safely departs from it's docking station and navigates around the room using an advanced pathing algorithm to optimize safety. Interactive features include games like reaction time,
a sound intensity test, reaction time test, and games like addition, multiplication, and tic-tac-toe.

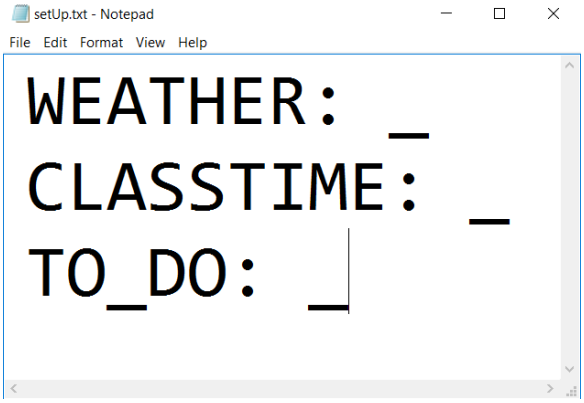
The kit includes the robot, docking station, charger, and blue safety Tape. The robot uses 2 large motors for the wheels, and 1 medium motor to rotate the Ultrasonic Sensor. It also uses 1 Touch Sensor, 1 Color Sensor, and 1 Sound Sensor.

SET-UP

Robot Set-Up

Set up: Set auto turn off to 'never'.

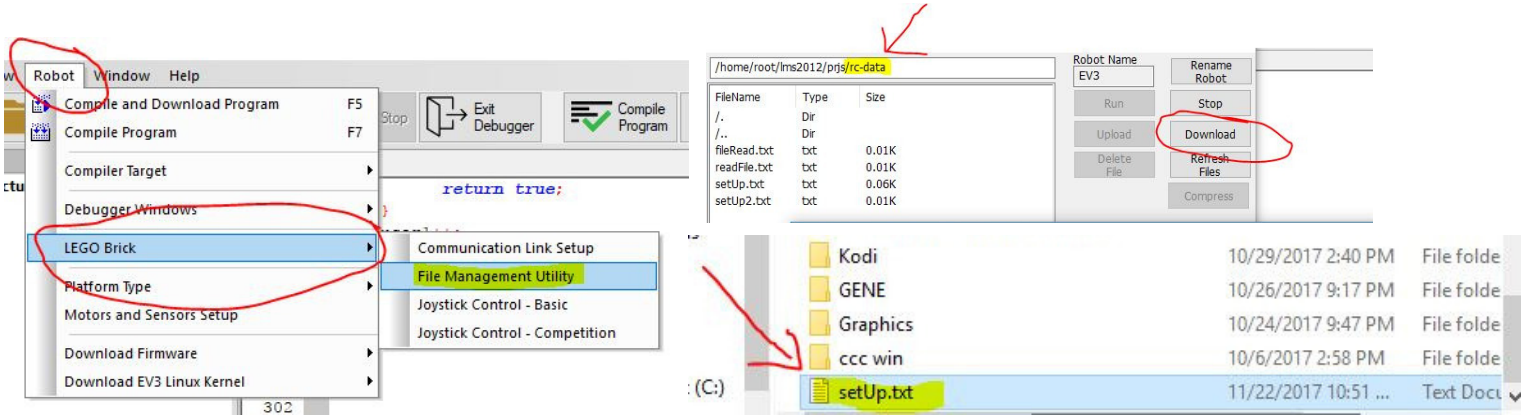




optional
Open setUp.txt and
Set weather for the next day.
Set starting class time for the next day.
Set notes/to do list.

1. Type in information in setUp.txt
2. Open RobotC
3. At the Task Bar, go to Robot -> Lego Brick -> File Management Utility
3. Go to rc-data, click Download, and select setUp.txt

Additional Notes: DO NOT LEAVE BLANK, SPACES, put _ as a place holder. If you want to write a sentence, separate words with _ instead of a space. 25 character limit per sentence
For example:
This_is_a_sentence.

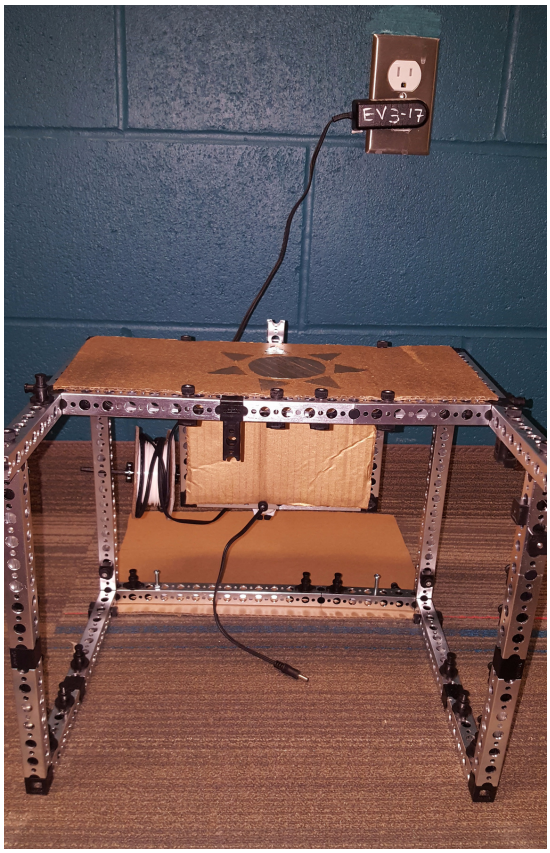


Place red tape around areas where you don't want the robot to traverse.

RECOMMENDED: Place tape around your bed mat area. This is to prevent you from stepping on the robot as you're getting out of bed. Place blue tape around hazard areas such as the top of stairs.

SET-UP

Robot Set-Up



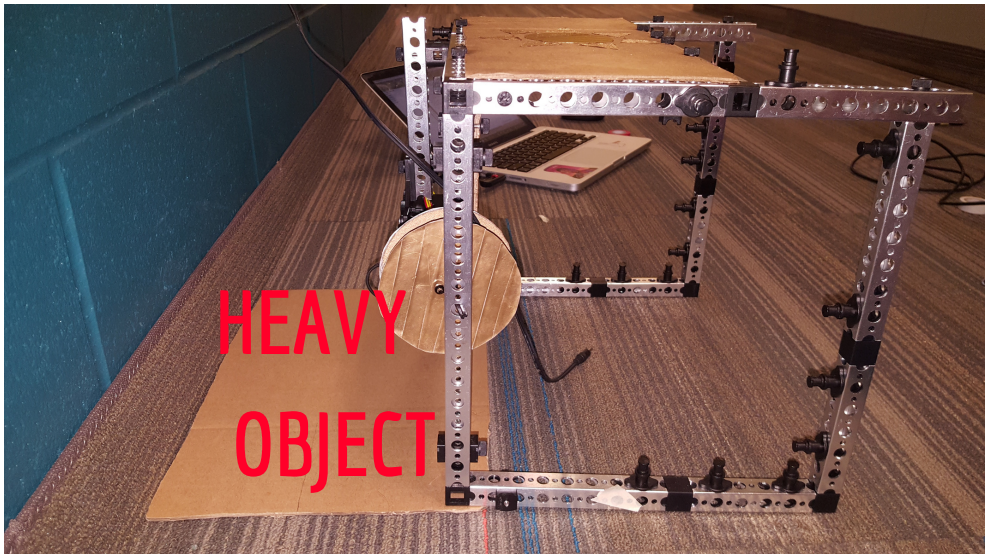
Place Docker in your desired spot in your room. Ensure that the area in front of it is clear so that the robot can drive out of the docking station.

Run 'AutonomousAlarmClock' on EV3 console

Set current time then awake time.

Before placing the Robot in the docker overnight, make sure the Ultrasonic Sensor is facing the front of the robot,

Plug the robot in and orient it so that it is facing the docker.



Place docker under heavy object such as table, nightstand, bed, etc.

SOFTWARE

Time Setter

Left and Right buttons toggle whether you want to change the hours or minutes.

Up and Down buttons increase/decrease the current time by 1 hour/minute.

Pressing enter button locks in the time set by you.

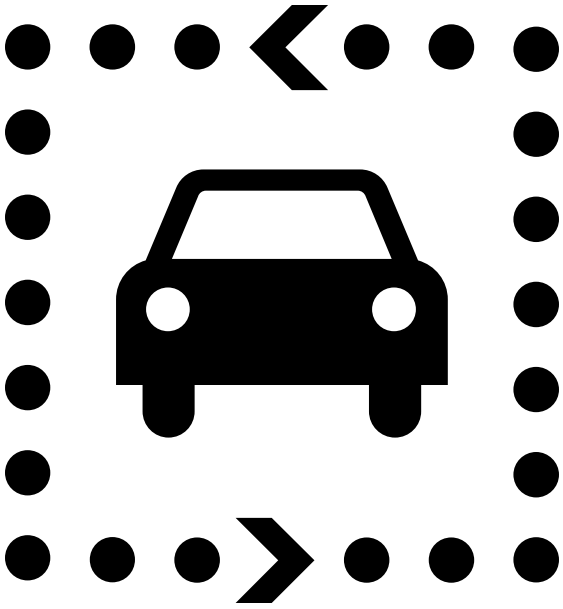
In the background, the software calculates the time difference in seconds (taking into account the 24-hour clock) and returns the time difference to the main function.

The built-in timer in the EV3 is used to count up towards the time difference. When the timer ends, your alarm will sound.

To override the program and reset the time, press any button. Otherwise, wait until the timer reaches its limit.

SOFTWARE

Undocking



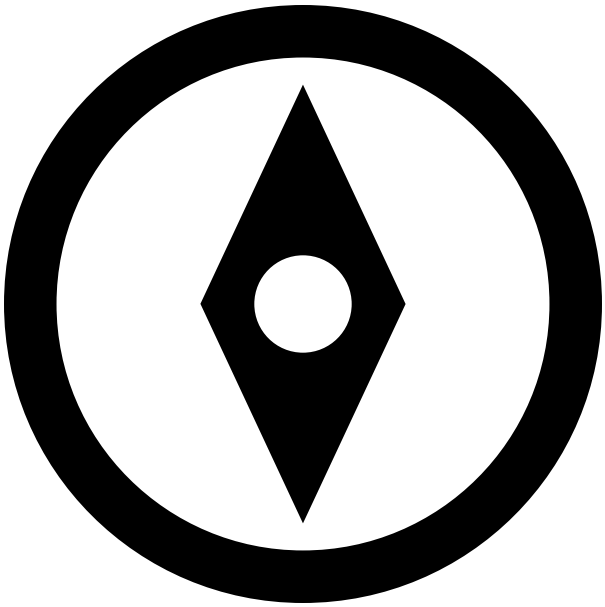
When the wake-up time is reached, the undocking algorithm begins.

The Ultrasonic Sensor initially faces the back of the the docking station. Upon the program commencement. the sensor will turn 180 degrees and check if there's an obstruction right in front of the docking station. If it's still there after 60 seconds, the program will bypass the pathing algorithm and continue playing the alarm in the docker.

If there are no objects and the path is clear, the robot will back up for 1.5 seconds, effectively unplugging itself from the charger. It will then turn 180 degrees and start driving forward, initiating the pathing algorithm.

SOFTWARE

Pathing



The robot will play the alarm while it's driving around the room.

The Ultrasonic Sensor will swivel left to right, dictated by the values of the motor encoder for motorD (-90, 90).

The robot will avoid obstacles within 100 cm from the Ultrasonic Sensor. The robot will turn left if the Ultrasonic Sensor is to the left (encoder is ‹ 0) and right if the Ultrasonic Sensor is to the right (encoder is › 0). The robot will continue turning until the nothing is 100 cm from the Ultrasonic Sensor.

While driving, if the robot hits something (indicated by the touch sensor) or detects the colour blue (from the blue tape), the backing algorithm will begin.

Backing Algorithm: If the Ultrasonic Sensor is to the left, the robot will back up to the right. If the Ultrasonic Sensor is to the right, the robot will back up to the left. After 1.5 seconds or if the colour blue is detected, the robot will continue straight.

The pathing algorithm will end after a button is pressed, meaning you woke up, or after 10 minutes, meaning you couldn't be woken up.

SOFTWARE

SOUND TEST

Using the NXT Sound Sensor, the robot checks for the intensity of the sounds you make.

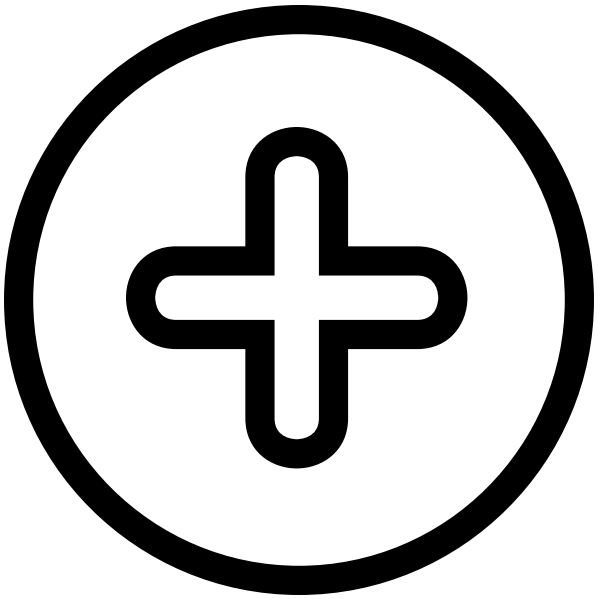
The robot will continue to play the alarm until you press any button to start the test. This will turn off the alarm,

The robot will count down from 3 and then prompt you to make some noise. The value of the sound sensor must be greater than 75 for the program to proceed. This means that you have to create a noise (ie scream, clap your hands) at a certain decibel level. If that threshold is not reached after 3 seconds, the robot will loop and continue to play the alarm until you press any button to start the test again.

If the program has been idle for 5 minutes, it assumes that you've not woken up and terminate the program.

SOFTWARE

Addition / Multiplication Game



This function engages the user's logic and reasoning. The user must get 5 questions right from both games to proceed.

The function begins by prompting the user with the instructions and playing the alarm until any button is pressed.

After the program will pick 2 random numbers from 0-100 for addition and 0-10 for multiplication. It will then pick randomly (50% chance) whether it will display the right answer or the wrong answer.

The user will then press the left button if they think the statement is false and right button if they think the statement is true. The program will display whether they got the right answer or not.

If the user is idle for more than 30 seconds, then the alarm will play again and prompt the user to press any button.

The program will end if the user gets the correct answer 5 times or if the user does not get 5 correct answers in 5 minutes.

MECHANICAL

Sensors

A variety of sensors are used in this robot to provide you with the best user experience possible. The robot uses the following sensors: touch, ultrasonic, colour, and sound.

Touch: Detects objects very close to, if not touching, the sensor. This helps the robot navigate around the room and avoid obstacles safely and effectively.

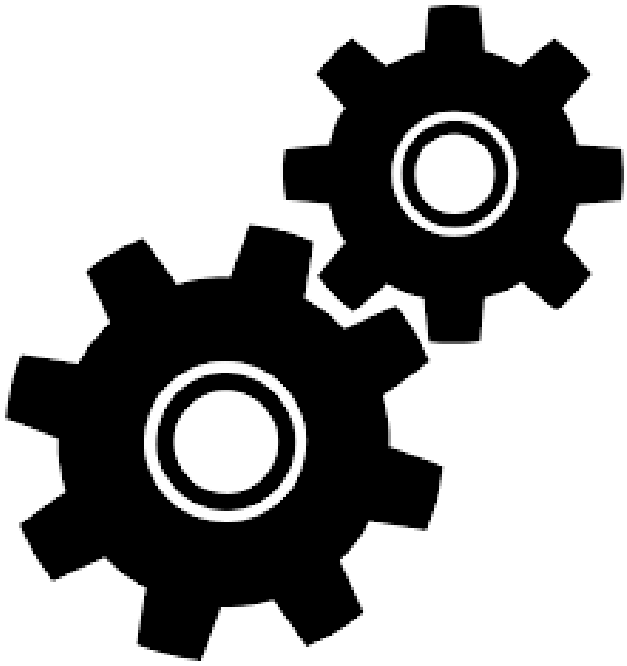
Ultrasonic: Detects obstacles up to 100cm away from the robot. It's configured on an axle so that it rotates 180 degrees, continuously checking the possible paths the robot could take. The ultrasonic sensor used in conjunction with the pathing algorithm result in elegant robot movement.

Colour: Detects the colour blue. This is useful because the robot has been programmed so that upon detecting blue, the robot will back away and avoid the blue. This greatly improves the safety of this robot system, protecting both the robot, and your valuable belongings.

Sound: Detects the intensity of sound. The louder the noise (vocal or physical), the greater the sound intensity number. The use of the sound sensor increases the effectiveness of this robot alarm by diversifying the methods of stimulation.

MECHANICAL

Design Elements



Three wheel system: The robot has two main wheels at the front and a roller-ball wheel in the back. This arrangement gives the robot stability and maximum maneuverability, demonstrating the key elements of functional design.

Compact Design: The Robot was designed to be as close to the floor as possible so that it could go under common household items like chairs. Also, the robot has a relatively small width, making it more nimble.