



TITLE: Project with voice-controlled object

LEARNING SCENARIO

School:	Duration (minutes):	90
Teacher:	Students' age:	13-14

Essential Question:

How does voice-controlled object work?

Topics:

- Interpreting outputs of voice-controlled object algorithm

Aims:

- Practical use of voice-controlled object

Outcomes:

- Exploring the possibilities of Speech to Text extension in Scratch

Work forms:

- *work in pairs, group work*

Methods:

- *presentation, talk, discussion, interactive exercise*

ARTICULATION

Course of action (duration in minutes)

INTRODUCTION

Announcement of the goal of the lesson:

Understanding voice-controlled object algorithm and its usage through a practical project.

Ask your students if an object can be voice controlled.

Is it possible to benefit from voice-controlled objects in some way?



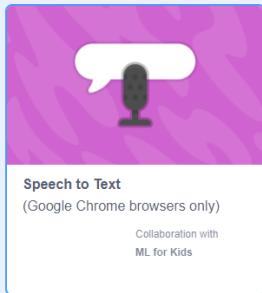


MAIN PART

Through a project, the teacher instructs students on Scratch commands and skills as well as on how to train a model to convert speech to text.

Step 1: Open your Chrome web browser and go to: <https://machinelearningforkids.co.uk/scratch3/>

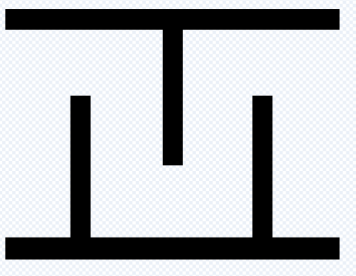
Step 2: Load extension Speech to text (STT - Google Chrome browsers only)



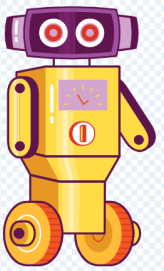
Step 3: Delete Cat sprite by clicking on sprite trashcan icon

Step 4: Download maze.png from:

<https://drive.google.com/file/d/11YBBhQclhVfHYMWelKhgAYKSwfv33pT5/view?usp=sharing> and upload it to Scratch as custom sprite



Step 5: From sprite gallery choose Retro Robot and use the second costume (Retro Robot b)



Step 6: From sprite gallery choose Home Button



Step 7: Make 3 variables (for all sprites):

- **gameover** (shows how the game ended)
- **xm** (x position of robot)
- **ym** (y position of robot)



Step 8: Make a list and change its name to:

endtalk (displays the game over message, depending on how the game ended)

Step 9: Switch to **maze sprite** and start coding. First few blocks are setting the position, size, and visibility of the maze. Forever loop that follows is a collision checker. In case of collision, the **gameover** variable is set to 1.

```
when clicked
go to x: 0 y: 0
set size to 120 %
show
forever
if touching Retro Robot? then
set gameover to 1
```

Step 10: Switch to **Home Button** sprite. The code is almost the same except that in case of collision a **pop** sound is played and the **game over** variable is set to 2.

```
when clicked
set size to 100 %
go to x: 195 y: -120
show
forever
if touching Retro Robot? then
play sound pop until done
set gameover to 2
```

Step 11: The main code is assigned to Retro robot code and there are 5 threads which start simultaneously.
11.1 Flag (start) code sets the variables, list entries (and deleting all previous entries), position and visibility. At the end there is a listening block (from STT extension) in the loop.

```
when clicked
delete all of endtalk
insert Game over! Robot crashed! at 1 of endtalk
insert You won! Robot returned to base! at 2 of endtalk
set gameover to 0
set xm to -200
set ym to 0
go to x: xm y: ym
go to front layer
set size to 30 %
show
forever
listen and wait
```





11.2 The next 4 threads are triggered by speech recognition and each recognized voice command is handled by a sequence of blocks.

If no collision is detected (gameover is 0) robot moves in specific direction (by changing xm or ym value and moving robot to calculated position).

If collision is detected (gameover is 1 or 2) game over message (from the list) will be displayed and the program will stop.

```
when I hear up
if gameover = 0 then
  change ym by 20
  glide 0.25 secs to x: xm y: ym
else
  start sound computer beeps1
  say item gameover of endtalk for 3 seconds
  stop all

when I hear left
if gameover = 0 then
  change xm by -20
  glide 0.25 secs to x: xm y: ym
else
  start sound computer beeps1
  say item gameover of endtalk for 3 seconds
  stop all

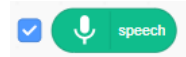
when I hear right
if gameover = 0 then
  change xm by 20
  glide 0.25 secs to x: xm y: ym
else
  start sound computer beeps1
  say item gameover of endtalk for 3 seconds
  stop all

when I hear down
if gameover = 0 then
  change ym by -20
  glide 0.25 secs to x: xm y: ym
else
  start sound computer beeps1
  say item gameover of endtalk for 3 seconds
  stop all
```

Step 12: Try to use your native language voice commands and see how it works.

Discuss how (in)correct spelling affects the speech recognition.

Turn on (check) speech recognition results.



CONCLUSION

Object tracking robots, if they can be controlled smartly through voice, can be of tremendous help for the physically handicapped people. A speech recognition system is used to recognize a set of predefined commands such as forward, backward, left, right and rotation at a particular turning angle. The robot navigates its way as per the voice-command signal, while also tracking the desired object. The voice-





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command signal processing is carried out in real-time, using an on-time cloud server that converts it to text form. The command signal text is then transferred to the robot via Bluetooth network to control its differential drive. The prototype smart robot consists of three sub-systems: speech recognition system, object tracking system and the differential-drive based movement's control system. The accuracy and efficiency of the speech recognition system is examined through a set of experiments. The effect of factors such as noise and distance etc. are examined, with encouraging results. The prototype robot can recognize the voice-commands within a Bluetooth range, i.e, 10 m. Possible extensions are also discussed that could lead to a wide range of further applications.

Do the K.W.L. (**K**now, **W**ant, **L**earned) chart with your students.

What I K now	What I W ant to Know	What I L earned

Methods

presentation
interactive exercise / simulation on the computer

Work forms

work in pairs
group work

Material:

- <https://machinelearningforkids.co.uk/scratch3/>
- <https://drive.google.com/file/d/11YBBhQclhVfHYMWeLkhgAYKSwfv33pT5/view?usp=sharing>

Literature

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PERSONAL OBSERVATIONS, COMMENTS AND NOTES





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