Assignment Cover Sheet

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ASSIGNMENT/PRAC NAME: Interacting with Robotic Systems

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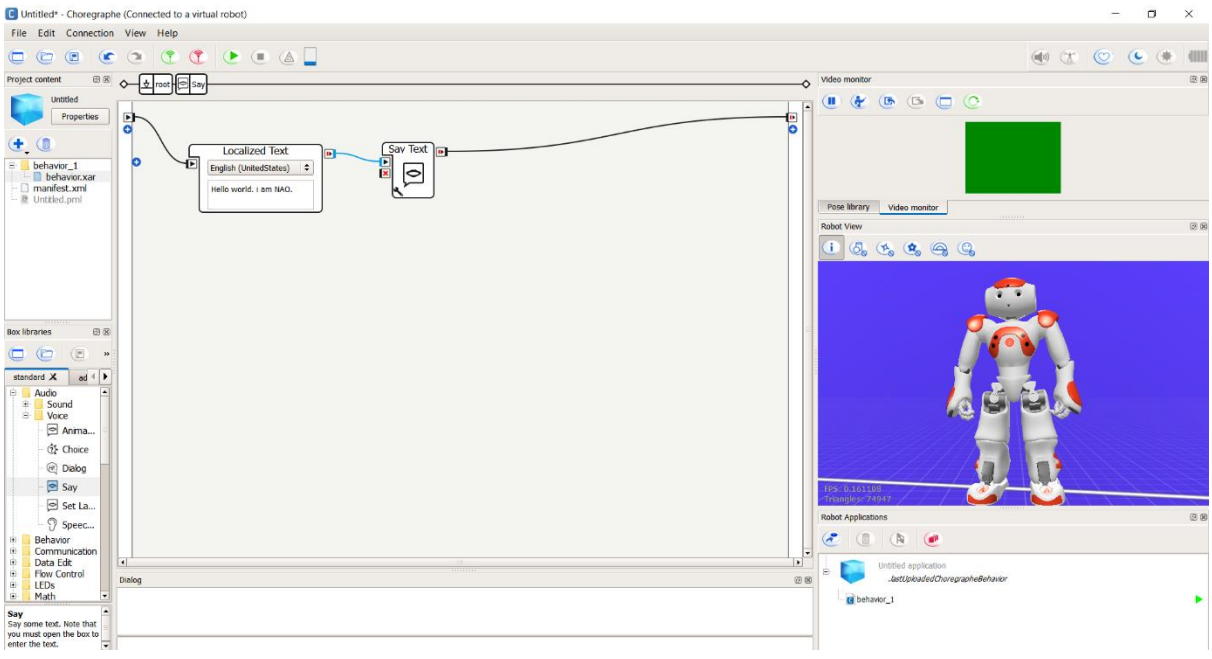
Report on Interacting with Robotic Systems

Problem statement

In the modern era of robotics, it is a big thing for a robot to speak a language that humans speak (as seen in the recent sci-fi movies). This report is about is NAO robot which sounds like a robot or a machine will probably sound like. The way the robot speaks in a machine accent is not easy to understand easily. Moreover, the robot does not use punctuations in its speech. So, the problem is making the robot sound as much as human like.

Background knowledge

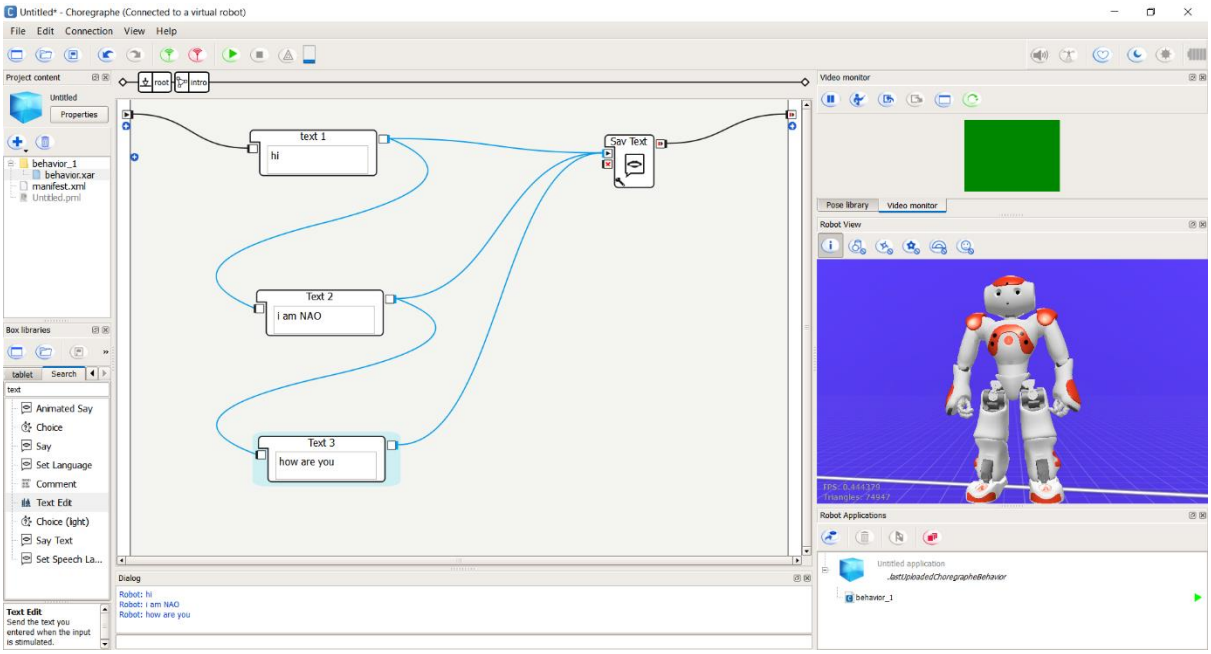
For this task, the root does not need to be in a standing position. It can be in a sitting or at rest position as it does not require to move around. Create a 'hello world behaviour' for NAO robot (use http://doc.aldebaran.com/1-14/getting_started/helloworld_choregraphe.html for help).



Hello world behaviour for NAO robots

After creating hello world, next step is to create flow diagrams by right-clicking the mouse, selecting create a new box and then selecting diagram. Then giving the name to the diagram, let's say giving it a name 'intro'. Double-click on the box made and the

add a say text option from the left-hand side menu. Then add text edit box and write what you want the robot to speak.



Flow diagrams for the speech

The robot will speak in a robotic manner which is difficult to understand and can only be understood if listened carefully. This is because the robot is just reading the text that has been entered in the text edit box and thus cannot speak in such a manner that it can be regarded as a proper human speech. Furthermore, the voice is far from human-like.

Investigations

There were several investigations done to correct the speech of robot. Main investigations conducted were voice modulation by changing the speed and shape of voice, and text to speech by using delay and wait functions in choregraphe.

1.Text-to-Speech Synthesis

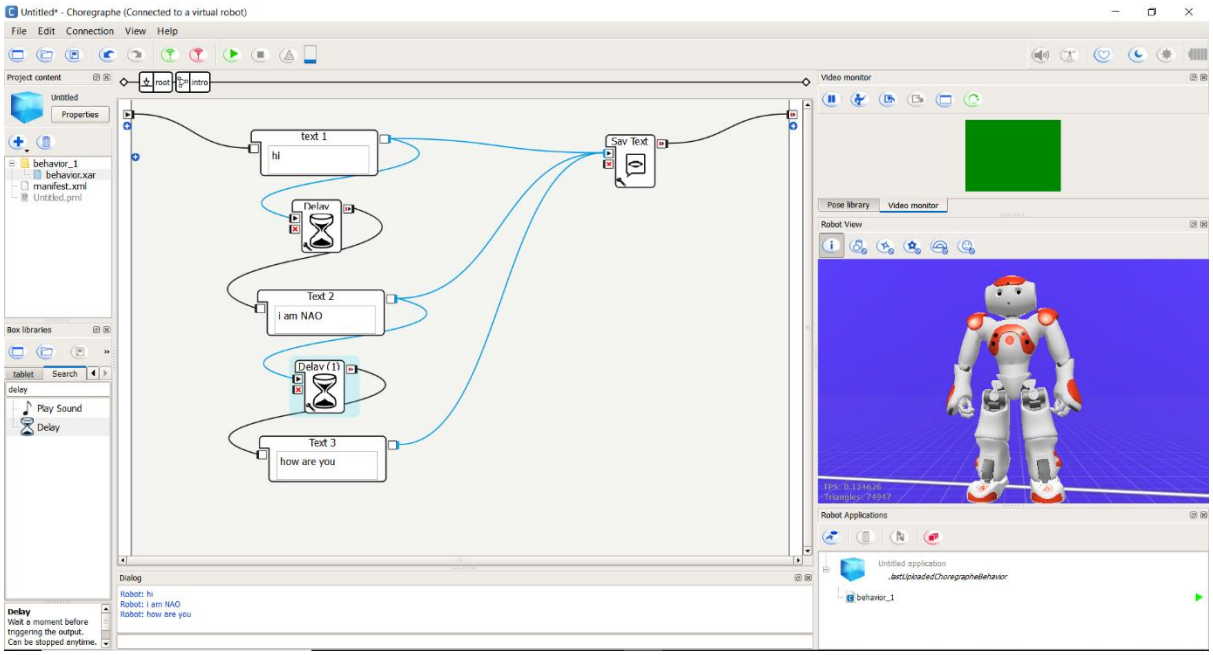
Objective:

Purpose of this is to make the robot pause in sentences. This gives defines a speech more accurately as now there are pauses in its speech which gives a sense of punctuation used in NAO's speech.

Solution Design:

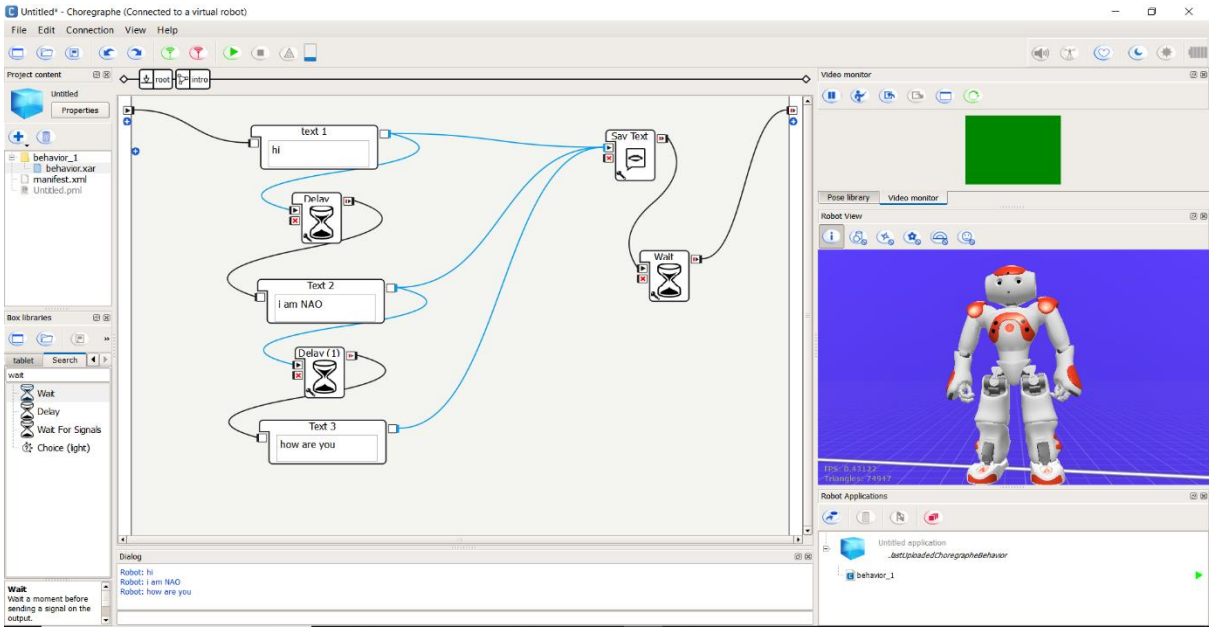
Firstly, delay function will be used in choregraphe. To use it, first select the delay function from the flow control folder in the left-hand side. Add it between two of the text edit box. Now set different timings for the delay box and select the one which is according

to your need.



The design with delay function

Now, another function Wait is used. Delay and wait sound like they should be doing the same thing but the difference between them is that delay function is having multiple inputs and multiple outputs whereas in the wait function, input starts the timer and if the input is triggered before the timer ends, the timer resets again. The wait function is used at the end after the say text function and it needs to be as long as the two inputs. These two functions are together used to create a good speech. For further details go to http://doc.aldebaran.com/2-1/naoqi/audio/altexttospeech-tuto.html



Delay and wait functions together in use

Risk assessment and precautions:

Since the robot is in sitting position, there is not much risk. There needs to be safety for the robot. There should be at least 30 centimetres of clear space around the robot.

Testing procedure:

For testing it, make the design in choregraphe first as mentioned above. Then use different values for testing the speech in robot. Count the total time taken for all the text boxes to work and give that time to the wait function so that it works properly. Different combinations will give different effects.

Outcomes:

Delay and wait function created different effects in the speech, for example when using the upper mentioned functions for the Hamlet by Shakespeare, it created dramatic effect after text box. the more time it is given in delay, the more time it takes for the next one to trigger and sometimes instead of the second txt edit box third text box was triggered first. This would mean the timings in the delay was not correctly set up and needs to be corrected.

Reflection

This task solves the problem of robot speech up to a certain extent and further development might even achieve a properly speaking robot which speaks with correct pauses and can easily be understood by humans. The learning outcome in this task was that even a robot reads the text typed by the user and then modulates its speech according to the delay and wait functions.

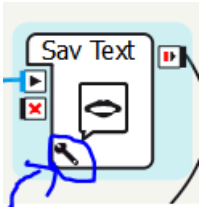
2.Modulation in speech

Objective:

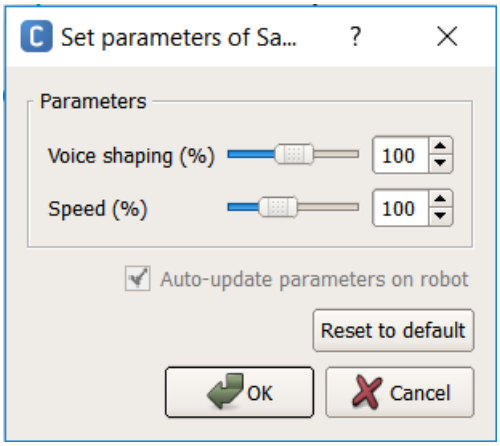
The objective of this part is to make changes to the shape and speed of the speech of NAO using Choregraphe and see how it changes it sounds.

Solution design:

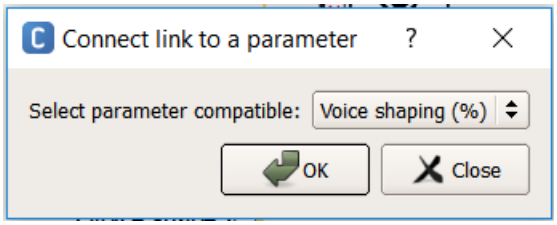
To do this task, make a design for the above-mentioned problem. There are various methods to do this. One way is to select the say text box and click on the spanner icon in the left bottom corner as marked in the picture below.

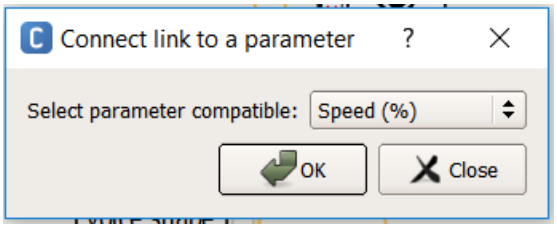


Then a box will pop up. In that box, there will be two options written which will help to change the speed and the shape of voice.



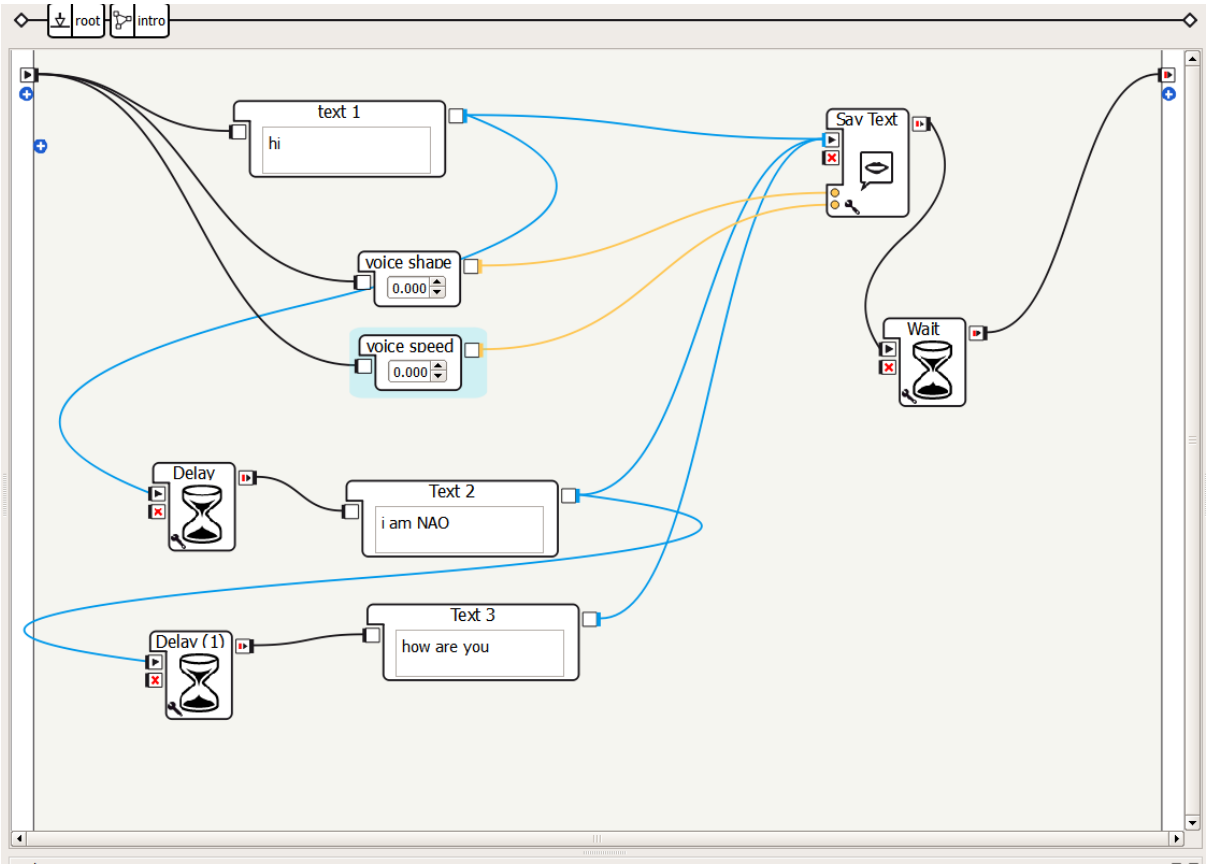
Another method to do this task, is by adding two number edit box from the left-hand side menu. Since the voice shaping and voice speed are in integers, it can be done by number edit box. connect these two boxes with the spanner in the say text box. Pop ups shown below will come out.





Click OK, and in the end, one should end up with the design given below.

The shape and speed can be changed by these two functions. To read about it in deep, follow the link http://doc.aldebaran.com/2-1/naoqi/audio/altexttospeech-tuto.html#modifying-speed



The design for speech modulation

Risk assessment and precautions:

While doing this task ensure that the robot is sitting in a stable position with at least 30 centimetres in each direction of it.

Testing procedure:

For this task, make the design as above mentioned and then increase the speed slowly. The robot will start sounding like someone who speak very fast. Now increase the voice shape and it is seen that the voice goes much deeper as the voice shape is increase. Different combinations can be used make different types of voices for example, a chipmunk or an old woman.

Outcomes:

With the help of this speech modulating function we can get different functions for the speech of the robot. But it is not easy to find the right set of values for the robot. A lot of time is needed to set the robot. However, with practice one can get better with speech modulation.

Reflection:

The learning outcome while doing this task was how to make it sound differently so that it can be used in different real-life applications or become a helping hand in daily life.

Conclusions

While doing these tasks it was pretty difficult to get it done correctly. The proper set of values were not determined. It can be considered as a good solution but not a best one. To find the proper values it takes a lot of time. This time can be saved easily if I they can give proper values for a particular type of speech or they can give the values for how a robot can mimic a human sound. However, it was a stepping stone in learning robotics which is the technology of future and overcoming the problems not only creates a better future but increases one's knowledge.

References

- Deakin university, SIT122 resources
- More documentations from http://doc.aldebaran.com