Teo 2: emotional Teo
Advanced User Interfaces project
Advanced User Interface tutoring discussion #3

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Scenarios and feasibility study

Section 1

Manual behaviour

Scenario 1: Talk2Teo (manual behaviour)

Movement - motors:

Delivered state:	*not functional*
Actual state:	*fully functional*
HW requirements:	rotation speed issue (*solved*)
SW requirements:	the motors are working with simple commands

Scenario 1: Talk2Teo (manual behaviour)

Emotional faces - LED matrix and strips:

Delivered state:	*functional*
Actual state:	*to be tested*
HW requirements:	it is necessary to check the <u>power requirements</u> that could limit the use of the subsystem.
SW requirements:	it is feasible to generate and design different emotional responses and states conveyed through facial expressions.

Scenario 1: Talk2Teo (manual behaviour)

Voice generation - bluetooth speaker:

Delivered state:	*functional*
Actual state:	*to be tested*
HW requirements:	*none*
SW requirements:	- the BT speaker is not controllable from the Arduino, thus, the PC must enter the control loop. Therefore, synchronization must be handled.
	- audio files vs. voice synthetizer (realistic vs flexibility)

Scenario 1: Talk2Teo (manual behaviour)

Controlling - XBOX360 joypad:

Delivered state:	*none*
Actual state:	*to be implemented*
HW requirements:	*none*
SW requirements:	- the use of a configurable joypad implies the necessity of a PC
	- it is required to develop a graphical user interface to allow therapists
	to select among default set of commands and possible customization
	- it is required to develop a program that allow the
	communication between joypad, PC and Arduino

Scenario 1: Talk2Teo (manual behaviour)

Conclusions:

The hardware and software of the platform is ~70% functional that could allow the further development of application software in the time allotted to realize the teleoperated Teo scenario, which could be a useful tool as companionship for the NDD children during therapy sessions.

Currently, the only limitation that could be considered a determining factor in the feasibility of the project would be the power issues during the use of the LED matrix and strips that could determine the correct performance of the system.

Automatic behaviour

Scenario 1: Talk2Teo (automatic behaviour)

Looking for children:

Description:	when Teo falls out the child perception, the robot starts looking for him.
HW requirement: **SW requirement:**	distance and movement sensors (the delivered is *functional*). control software must be realized in order to obtain the environment detection. A state machine that generates the reactions based on sensors input has to be implemented.

Hit or hug?

Description:	when the child hugs or hits Teo, it reacts.
HW requirement:	pressure sensors are not functional due to problems in physical positioning.
SW requirement:	control software must be realized in order to obtain the environment detection. A state machine that generates the reactions based on sensors input has to be implemented.

Backchanneling

Description:	Teo provides continuers and assessments in order to simulate comprehension and interest.
HW requirement:	more powerful computational resources to handle backchanneling algorithms are needed.
SW requirement:	backchanneling algorithms that allow to identify the correct moments to generate the reactions.

Scenario 1: Talk2Teo (automatic behaviour)

Conclusions:

From the above SW and HW, the backchanneling behaviors are out of range based on the current state of the platform.

In the time allotted is not feasible to achieve a fully functional platform and add new computational resources to develop the behavior (the more simple behaviors may be possible).

However, it might be more interesting to use the available time to integrate the same requirements in the Marco-Polo game.

Section 2

Scenario 2: Marco-Polo game

Sound localization - microphones:

Description:	Teo localizes the source of a vocal sound. Current techniques are based on DSP (Digital Signal Processing) algorithms that are time-sensitive and relatively computationally expensive. The best technique is based on a mic array and the measurement of the time delay between the signal received, that makes it independent from the relative distance between the source and the mics.
HW requirement:	it is necessary to construct physical supports for the microphones.
SW requirement:	the algorithm implemented is extremely sensible to noise positioning.

Movements - motors:

Description:	Teo has to move in a smooth and safety way.
HW requirement:	rotation speed issue (*solved*)
SW requirement:	it is necessary to implement a velocity control in order to approach kindly to a child.

Scenario 2: Marco-Polo game

Conclusions:

The feasibility of this scenario depends heavily on the acoustic localization algorithm from which still is not determined that is possible to implement on the current platform.

As it builds upon of other HW and SW part that are going to be implemented for Talk2Teo, it would be possible to leave the bases done for the intelligence implementation for the game.

Section 3

Checkpoints projection:

Description:	The child is guided by a floor projector which projects pictures on the checkpoints.
HW requirement:	it is necessary to have a floor projector.
SW requirement:	*none*

Checkpoints identification:

Description:	Teo has to recognize the checkpoints
HW requirement:	It has been proposed to use RFID tags to identify the checkpoints from which Teo could receive a signal that serves the purpose to check whether the correct checkpoint was reached and provide the emotional reward to the child. Hence, a RFID reader should be added to the current system.
SW requirement:	the implementation of control software must be done.

Conclusions:

Given that new HW must be added to the system and that this scenario depends heavily on the implementation of the scenario Marco-Polo,
it has little chance to be implemented with the current hardware and time resources allotted for the project.
The implementation of this scenario is preferable to be left as a suggestion for further development with Teo's platform.

Thanks!

http://www.xkcd.com/1403