**Abstract**

A web application for the Children’s Hospital of Philadelphia (CHOP) was created for the use of survey management and creation. The application runs on a node.js environment with mongodb data management, allowing both online and offline functionality. Integrating Item Response Theory (IRT) into the survey algorithm allows doctors to ask the right questions depending on a patient’s answers. This also cuts back on the number of questions that a patient needs to answer before a proper analysis on their results can be computed.

As a follow up to making the survey process smoother and easier for children, interaction through NAO robots is being looked into. The small robot is able to communicate and respond to gestures and speech, allowing doctors to stream their survey through NAO. While the child is talking with NAO, doctors are able to get crucial information from their patient with a smaller risk of bias since reading capability is no longer a barrier to taking the survey. The children would be able to participate at their own pace with an ever learning friend. Using OpenCV software, facial recognition brings a lifelike feeling to the human-robot interaction and emotion detection alerts NAO of when to pause from asking questions to lighten the mood.

This robot-centered survey research is focused on children ages five to seven with Autism Spectrum Disorder (ASD). The lack of supervision needed to ask these children confidential survey questions will increase the accuracy of the results as well as give a look into how to diagnose them. Studies show that children with ASD react in certain ways that can lead to different diagnoses depending on how they are affected by their disorder, which will be monitored through the NAO robot.

**Methods**

Web Application

* Program functionality using Jade and JavaScript
* Integrate Item Response Theory (IRT) using R code

NAO Robot

* Create program modules in Choregraphe software
* Enhance vision recognition capability with OpenCV
* Build speech-to-text capabilities using Python

**Results**

Pilot data shows that the NAO robot is a viable method for collecting survey data from children. The interactivity of the robot brought a twist to the survey process that provoked enthusiasm and excitement rather than a tedious reading and checking-off route. The two children were constantly talking to the robot, trying to figure out what he could and couldn’t say and do. The lack of diversity in the robots was an unexpected pitfall, since it has a very limited speech-pool and one dance aside from the linear survey package.

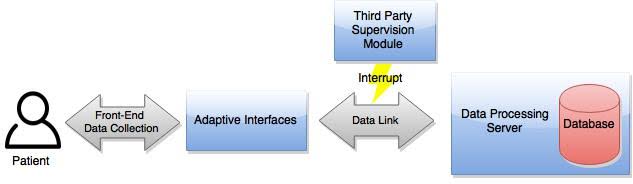
One of the children, a teenager with ASD, was having a rough day before meeting with NAO. However, his mood and outwardness improved upon entering the lab where NAO was waiting. NAO was not seen as a person who was going to be giving a survey but rather a cool robot creation with awesome features to explore. This is important because the purpose of the survey is to get accurate responses. If the children view NAO as something they can talk to about anything, the validity of responses will increase as will the overall survey process.

A problem noticed is that the child sometimes give an answer just to give an answer. They care more about interacting with the robot and it interacting back then actually giving truthful responses. This may be because the question asked was above the level of the child asked, despite the questions coming from a tested bank of questions for their age and level, but more research will have to be done to confirm this claim. Another possibility is that the tested bank of questions accounted for parents being there with the children whereas parent interaction was prohibited for the purposes of our study. Therefore any “difficult” questions or words would have been taken care of by the parent while in our case the children just had to give an answer.

**Figure 1**

Choregraphe

**Figure 2**

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**Figure 3**

Freaky face

**Conclusion**

This is an ongoing project is awaiting response for a three year NSF grant proposal. As of this point we can only verify that use of the NAO robot for giving surveys to children with ASD is possible. The data collected so far is pilot data that will be used for the continuation of a more in-depth study.

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