SpeechBuddy

Project website https://gnadnivek.github.io/

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Proposal

An intelligent voice interface that is able to listen and interpret what the user has spoken. Input will be translated into text and stored in a database.

The problem this project solves is that it helps users take simple notes, such as a grocery list or small reminders for when you don't have a pen and paper available. This project will help solved problems where people forget an important detail or appointment, by storing what the user says into a readable text format.

Similar to Apples Siri and Microsoft's Cortana.

Executive Summary

As a student in the Computer Engineering Technology program, I will be integrating the knowledge and skills I have learned from our program into this Internet of Things themed capstone project. This proposal requests the approval to build the hardware portion that will connect to a database as well as to a mobile device application. The internet connected hardware will include a custom PCB with sensors and actuators for *speech recognition and voice recording*. The database will store *what the user says in a readable format saved on a database*. The mobile device functionality will include *storage for the recorded text and any reminders* and will be further detailed in the mobile application proposal. I will be collaborating with the following company/department, *I will not be collaborating with any companies at this moment*. In the winter semester I plan to form a group with the following students, who are also building similar hardware this term and working on the mobile application with me *Sanjay Jerad, and William Anderson*. The hardware will be completed in CENG 317 Hardware Production Techniques independently and the application will be completed in CENG 319 Software Project. These will be integrated together in the subsequent term in CENG 355 Computer Systems Project as a member of a 2 or 3 student group.

Background

The problem solved by this project is that it helps users take simple notes, such as a grocery list or small reminders for when you don't have a pen and paper available. This project will help solved problems where people forget an important detail or appointment, by storing what the user says into a readable text format.

There are several applications and hardware out there that utilize speech as input, such as Apple's Siri, Microsoft's Cortana or Amazon's Alexa. Some other hardware and software similar to our projects are Digital pens. This piece of hardware records what users write down as input, and saves it in a text format

on the computer. In this era there is not much mention of using a person's voice as input, and has not been a part a person's daily lives. You don't see people talking to their phone or microphone everywhere you look.

I have searched for prior art via Humber's IEEE subscription selecting "My Subscribed Content"[1] and have found and read (Segura-Garcia, Felici-Castell, Perez-Solano, Cobos, & Navarro, 2015) which provides insight into similar efforts.

The first article contains information related to text-to-speech output in technology. (Karabetsos, Tsiakoulis, Chalamandaris, & Raptis, 2009)

The second article's information is about discriminating between vocal sounds and environment sounds. (Yuan-Yuan, Xue, & Bin, 2004)

The third article relates to the behaviour of speech with service robots. (Wang, Leung, Kurian, Kim, & Yoon, 2010)

In the Computer Engineering Technology program we have learned about the following topics from the respective relevant courses:

- Java Docs from CENG 212 Programming Techniques In Java,
- Construction of circuits from CENG 215 Digital And Interfacing Systems,
- Rapid application development and Gantt charts from CENG 216 Intro to Software Engineering,
- Micro computing from CENG 252 Embedded Systems,
- SQL from CENG 254 Database With Java,
- Web access of databases from CENG 256 Internet Scripting; and,
- Wireless protocols such as 802.11 from TECH152 Telecom Networks.

This knowledge and skill set will enable me to build the subsystems and integrate them together as my capstone project.

Methodology

This proposal is assigned in the first week of class and is due at the beginning of class in the second week of the fall semester. My coursework will focus on the first two of the 3 phases of this project:
Phase 1 Hardware build.
Phase 2 System integration.
Phase 3 Demonstration to future employers.

Phase 1 Hardware build

The hardware build will be completed in the fall term. It will fit within the CENG Project maximum dimensions of 12 13/16" x 6" x 2 7/8" (32.5cm x 15.25cm x 7.25cm) which represents the space below the tray in the parts kit. The highest AC voltage that will be used is 16Vrms from a wall adaptor from which +/- 15V or as high as 45 VDC can be obtained. Maximum power consumption will be 20 Watts.

Phase 2 System integration

The system integration will be completed in the fall term.

Phase 3 Demonstration to future employers

This project will showcase the knowledge and skills that I have learned to potential employers.

The tables below provide rough effort and non-labour estimates respectively for each phase. A Gantt chart will be added by week 3 to provide more project schedule details and a more complete budget will be added by week 4. It is important to start tasks as soon as possible to be able to meet deadlines.

Labour Estimates	**Hrs**	**Notes**

Phase 1		
Writing proposal.	9	Tech identification quiz.
Creating project schedule. Initial project team meeting.	9	Proposal due.
Creating budget. Status Meeting.	9	Project Schedule due.
Acquiring components and writing progress report.	9	Budget due.
Mechanical assembly and writing progress report. Status Meeting.	9	Progress Report due (components acquired milestone).
PCB fabrication.	9	Progress Report due (Mechanical Assembly milestone).
Interface wiring, Placard design, Status Meeting.	9	PCB Due (power up milestone).
Preparing for demonstration.	9	Placard due.
Writing progress report and demonstrating project.	9	Progress Report due (Demonstrations at Open House Saturday, November 7, 2015 from 10 a.m. - 2 p.m.).
Editing build video.	9	Peer grading of demonstrations due.
Incorporation of feedback from demonstration and writing progress report. Status Meeting.	9	30 second build video due.
Practice presentations	9	Progress Report due.
1st round of Presentations, Collaborators present.	9	Presentation PowerPoint file due.
2nd round of Presentations	9	Build instructions up due.
Project videos, Status Meeting.	9	30 second script due.
Phase 1 Total	**135**	
Phase 2		
Meet with collaborators	9	Status Meeting
Initial integration.	9	Progress Report
Meet with collaborators	9	Status Meeting
Testing.	9	Progress Report
Meet with collaborators	9	Status Meeting
Meet with collaborators	9	Status Meeting
Incorporation of feedback.	9	Progress Report
Meet with collaborators	9	Status Meeting
Testing.	9	Progress Report
Meet with collaborators	9	Status Meeting
Prepare for demonstration.	9	Progress Report
Complete presentation.	9	Demonstration at Open House Saturday, April 9, 2016 10 a.m. to 2 p.m.
Complete final report. 1st round of Presentations.	9	Presentation PowerPoint file due.
Write video script. 2nd round of Presentations, delivery of project.	9	Final written report including final budget and record of expenditures, covering both this semester and the previous semester.
Project videos.	9	Video script due
Phase 2 Total	**135**	
Phase 3		
Interviews	TBD	
Phase 3 Total	**TBD**	
Material Estimates	**Cost**	**Notes**
Phase 1		

A microcomputer composed of a quad-core Windows 10 IoT core compatible Broadcom BCM2836 SoC with a 900MHz Application ARM Cortex-A7 32 bit RISC v7-A processor core stacked under 1GB of 450MHz SDRAM, 10/100 Mbit/s Ethernet, GPIO, UART, I²C bus, SPI bus, 8 GB of Secure Digital storage, a power supply, and a USB Wi-Fi adaptor.	>$80.00	An example of a retailer: [3].
Peripherals with cables		
Sensors		
Actuators		
Hardware, etc.		
Phase 1 Total	**>$200.00**	
Phase 2		
Materials to improve functionality, fit, and finish of project.		
Phase 2 Total	**TBD**	
Phase 3		
Off campus colocation	<$100.00	An example: [4].
Shipping	*TBD*	
Tax	*TBD*	
Duty	*TBD*	
Phase 3 Total	**TBD**	

Concluding remarks

This proposal presents a plan for providing an IoT solution for better planning and helps people set reminders of important details. This is an opportunity to integrate the knowledge and skills developed in our program to create a collaborative IoT capstone project demonstrating my ability to learn how to support projects such as the initiative described by [3]. I request approval of this project.

References

Karabetsos, S., Tsiakoulis, P., Chalamandaris, A., & Raptis, S. (2009). Embedded unit selection text-to-speech synthesis for mobile devices. *IEEE Transactions on Consumer Electronics*, *55*(2), 613–621. https://doi.org/10.1109/TCE.2009.5174430

Segura-Garcia, J., Felici-Castell, S., Perez-Solano, J. J., Cobos, M., & Navarro, J. M. (2015). Low-cost alternatives for urban noise nuisance monitoring using wireless sensor networks. *IEEE Sensors Journal*, *15*(2), 836–844. https://doi.org/10.1109/JSEN.2014.2356342

Wang, D., Leung, H., Kurian, A. P., Kim, H. J., & Yoon, H. (2010). A deconvolutive neural network for speech classification with applications to home service robot. *IEEE Transactions on Instrumentation and Measurement*, *59*(12), 3237–3243. https://doi.org/10.1109/TIM.2010.2047551

Yuan-Yuan, S., Xue, W., & Bin, S. (2004). Several features for discrimination between vocal sounds and other environmental sounds. In *2004 12th european signal processing conference* (pp. 2099–2102).