ADMINISTRATIVE INFORMATION:

- Project Name (tentative): Smart Cane Systems Integration
- Project Number, if known: P15043
- Preferred Start/End Semester in Senior Design:
  ☒ Fall/Spring ☐ Spring/Fall
- Faculty Champion: *(technical mentor: supports proposal development, anticipated technical mentor during project execution; may also be Sponsor)*

Name	Dept.	Email	Phone
Patricia Iglesias	Mechanical Engineering, KGCOE	pxieme@rit.edu	585-475-7694

For assistance identifying a Champion: B. Debartolo (ME), G. Slack (EE), J. Kaemmerlen (ISE), A. Becker-Gomez (CE)

- Other Support, if known: *(faculty or others willing to provide expertise in areas outside the domain of the Faculty Champion)*

Name	Dept.	Email	Phone
Gary Behm	Engineering Studies, NTID	gwbnts@ntid.rit.edu	
Tom Oh	Department of Information Sciences and Technologies, GCCIS	tomoh@rit.edu	585-475-7642

- Project "Guide" if known: *(project mentor: guides team through Senior Design process and grades students; may also be Faculty Champion):* *Gary Werth*
- Primary Customer, if known (name, phone, email): *(actual or representative user of project output; articulates needs/requirements):* Joe Kells –ABVI, Patricia Iglesias, Gary Behm, Tom Oh
- Sponsor(s): (*provider(s) of financial support):*

Name/Organization	Contact Info.	Type & Amount of Support Committed
ABVI		

PROJECT OVERVIEW:

Vision loss knows no boundaries; it can affect anyone, of any age, income level, race, or ethnic background, at any time. Regardless of the level of visual impairment, vision loss can impact a person's life and their ability to complete everyday tasks. One of the greatest challenges facing a person who is blind or deaf-blind is the ability to navigate safely and independently through the physical world. Traveling with little or no vision at all can be uncomfortable and frightening, limiting the ability to work, go to school, take care of personal needs, or socialize with others. Much research has been done worldwide on support systems for the visually impaired. However, most of this work includes audio interface which provides the hearing-blind person a sound feedback about the surrounding environment.

Devices relying on an audio signal for information conveyance are not well suited for noisy environments such as heavily trafficked streets where audible signals are difficult to detect and interpret. These devices are especially ill suited for deaf and blind individuals who are incapable of hearing the audio signals. This project will engage advanced technology to solve the age-old problem of assisting blind and deaf-blind people as they move about in their daily lives.

DETAILED PROJECT DESCRIPTION:

The goal of this proposal is to continue the 2014 MSD smart cane design activity to accomplish two major objectives: fully integrate the sensor suite (which was independently developed) and to correct the remaining issues identified in the closeout report. To accomplish the goals, the following list of objectives will be accomplished:

1. Integrate the sensor suite developed for Dr. Iglesias
2. Identify and correct design issues from MSD project P14043.
3. Amend the design to allow it to collapse into 8" lengths for storage & carry
4. Insure that the design is capable of manufacturing assembly by the blind or visually impaired.
5. Test, and evaluate the Intelligent Mobility cane with deaf-blind people.
6. Deliver a working prototype to the customer.

The prototype cane will be based on a standard long white cane shaft that is familiar to users. The user handle of the cane has a built-in sensitive tactile pad, and a detection system is mounted toward its tip. The sensitive tactile pad includes an integrated directional force feedback rumble unit which causes the tactile pad of the cane to vibrate in selected obstacle situations. The vibrations inform the user where and how far an obstacle or object is in real time. As the user encounters an obstacle, the force feedback rumble unit will guide the user away from an object based on the distance. The nearer the user to an obstacle, the sharper the force feedback rumble produced by the cane. As a result, the user will experience an enhanced sense of awareness of the environment through which they move.

- **Customer Needs and Objectives**:
  - Detect obstacles in front of the user to the right, left and front; and communicate the same via unique vibrations to the user
  - Detection range: 6 feet
  - Weight: existing cane plus 1 pound
  - Life: 8 hours without a battery recharge
  - Rechargeable batteries
  - Cane can be collapsed for storage & carry to 8" lengths, and easily reassembled by a blind person for use within 1 minute.
  - The cane manufacturing assembly can be performed by the blind or vision impaired.
  - The manufacturing cost shall be less than $125.

- **Constraints:**
  - $125 manufacturing cost
  - Manufacturing assembly by blind or visually impaired
  - Rechargeable batteries
  - Vibrational feedback

- **Project Deliverables:**

- Working prototype
- Complete documentation package (drawings, bill of material, analyses, tooling & fixtures, process sheets, test plans & test data)

- **Budget Estimate**: $1000
- **Intellectual Property (IP) considerations**: must be mindful of any existing patents, US & abroad.
- **Other Information**: Previous RIT MSD projects (see above)
- **Continuation Project Information, if appropriate**: (see above)

STUDENT STAFFING:

- Skills Checklist: *see attached.*
- Anticipated Staffing Levels by Discipline:

Discipline	How Many?	Anticipated Skills Needed (*concise descriptions*)
EE	2	Detection system/ Integration
ME	2	Force Feedback
CE		
ISE	2	DFM (blind assembly)
Other		

OTHER RESOURCES ANTICIPATED:

Category	Description	Resource Available?
Faculty	**Dr. Patricia Iglesias**	**Y**
	Gary Behm	**Y**
	Tom Oh	**Y**
Environment		☐
		☐
		☐
Equipment	**Prototype cane and sensor suite from previous projects including documentation**	**Y**

		☐
		☐
Materials		☐
		☐
		☐
Other		☐
		☐
		☐

Prepared by: Gary Werth and Patricia Iglesias Date: Revised 8/8/14