	Risk Item	Effect	Cause	Likelihood	Severity	Importance	Actions to Minimize Risk
General							
R1	Battery contact is compromised	Loss of power	Deflection of wire connection	2	3	6	Make sure all components that house wires are rigid and secure wires sufficiently for cane movement
R2	User Muscle Fatigue	Pain/discomfort to user	•How hand grips on handle •Weight distribution of cane	2	2	4	Ergonomics considered in design
R3	Over heating	Damage to system Harm to user	Insufficient heat dissipation	1	3	3	Perform thermal analysis
R4	Cane malfunction	No feedback delivered to user	Component malfunction or damage	1	3	3	Design for redundancy
R5	Misplaced parts	User frustration	Multiple unconnected in the system	2	1	2	•Make system all one piece •Create a way separate components can be stored together when not in use
Sensors							
R6	Sensors relay incorrect information to feedback	Confusion and/or danger to user	•Sensor malfunction •Broken connection •Problem with program	1	3	3	Test prototype extensively
R7	Sensors hit obstacles when cane is sweeping	•Damage to sensor •Shift in sensor position •Sensor falls off	Location of sensors on the cane	2	2	4	Attach sensors in the top region of the cane
R8	Sensors get dusty/dirty	Malfunction	Environment encountered	1	2	2	State in user manual that sensors should be cleaned frequently
Handle							

R9	Water damage	Ruined components	Not waterproof	2	3	6	•Minimize openings •Put waterproof cover over
R10	Loss haptic motion (when signal is send from sensors, feedback does not respond with motion)	Feedback not given to user	•Disconnection of feedback mechanism and motor •Burnout of motor	2	3	6	•Sufficiently secure roller to motor •Do analysis to make sure torque is not too high for motor
R11	Haptic motion is unclear and not intuitive	•User confusion •Learning curve to use cane	Haptic motion design	2	2	4	Do thorough testing to make sure haptic feedback relays information clearly to users
R12	Feedback is obstructed by clothing or jewelry (ex. Gloves)	Decreased feeling of feedback	Location where feedback comes in contact with the user	1	2	2	Brainstorm ways to minimize clothing/jewelry obstruction
R13	Motor vibrations harm user	Nerve damage	Magnitude of motor vibration (mm/s)	1	2	2	Do research on effects of vibration magnitude versus time of exposure. Ensure the motor ordered is below the limit.
R14	Degree of serviceability and ease part replacement	Defines if the handle can be fixed if a part breaks or if the user needs to go out and buy a whole new cane	•Lack of access to inside components •Can not remove/replace one part without removing/replacing another	2	3	6	•Design handle with an easily removable insert that contains an organized array of all handle components •Use commercially available parts so that they can be ordered separately