



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Deepro Pasha	Project Number S0826
Project Title Developing an Artificial Intelligence-Based Assistive Robot: A Novel Approach to Prevent Falling in Elderly People	
<p style="text-align: center;">Abstract</p> <p>Objectives The main objective of this project was to design, build, and program an artificial intelligence based assistive robot to prevent falling in elderly people. A combination of appropriate hardware design and software interface (programming) was used. The main hypothesis was to test if an artificial intelligence (AI) based assistive robot was possible to be built and programmed that can detect and act to prevent falling.</p> <p>Methods Simulation, image processing, blob detection, sideways detection using Harris corner detection algorithm, were used to set three parameters such as Parameter 1: Is height longer than width? Parameter 2: Is width continually increasing? Parameter 3: Is height continually decreasing? to detect falling. Depending on if each of the parameters are met or not, outputs were generated. The outputs were analyzed in python and were turned into one large array input that was read by a pre-trained back propagation neural network to determine whether or not it should take action. The steps were a) using OpenSim simulation software, example videos of falling were developed. b) based on the fall videos, sideways perspective and forward perspective fall detection algorithms were developed. c) algorithms were then used to develop codes and were run for multiple test cases d) a prototype of fall catching assistive robot was designed. e) hardware and software installation was performed. f) the effectiveness of the prototype robot was tested with test cases using dolls. g) algorithm was refined and the testing was repeated for improvement. Hardware used: Raspberry Pi 3, Ribbon Cable for GPIO, 40 pin breakout board, Breadboard, Jumper Wires, Motor (12V DC), L298 Motor Driver, 2nd Generation Raspberry PI camera, 610 mm long flex cable, 12V AC to DC adapter, wood, insulation and Software used: C++, Python 3, OpenCV, Raspberry Pi GPIO, OpenSim, Visual Studio.</p> <p>Results Final outcome of this project was a prototype assistive robot that was capable of detecting fall, capable to react to prevent fall within 2-3 seconds, capable of moving the robot arm at different angles.</p> <p>Conclusions My robot was tested on small dolls and was successfully detected and prevented falling. It was a prototype robot. For future improvement, the algorithm can be tested with large number of fall cases to further refine it. The response time of the robot can be improved from 2-3 seconds to real-time.</p>	
Summary Statement My project is about developing an artificial intelligence based assistive robot to detect and prevent falling in elderly people.	
Help Received Discussed informally few times with mechanical engineering professor Dr. The Nguyen at California State University, Fresno and science teacher of my school Mr. Matthew Carter for suggestions and advice but conducted the project entirely by myself at home and no lab facility was used.	