



Recording Stroke Patient Progress

Developing a File I/O System for Upper Limb Exo-Skeleton Arms

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Introduction

- Two upper limb exoskeleton arms
- Each arm has seven degrees of freedom.
 - Wrist: 3
 - Shoulder: 3
 - Elbow: 1
- The wearer wears both arms and can reach about 95% of the normal area of a human.
- The arms amplify the wearer's input using servos and actuators
- Wearer only feels portion of load
- Communicates with a target computer using a LAN connection
- Can be used for rehabilitation among stroke victims by using repeated movements



Dr. Jacob Rosen demonstrating both exoskeleton arms

Objectives

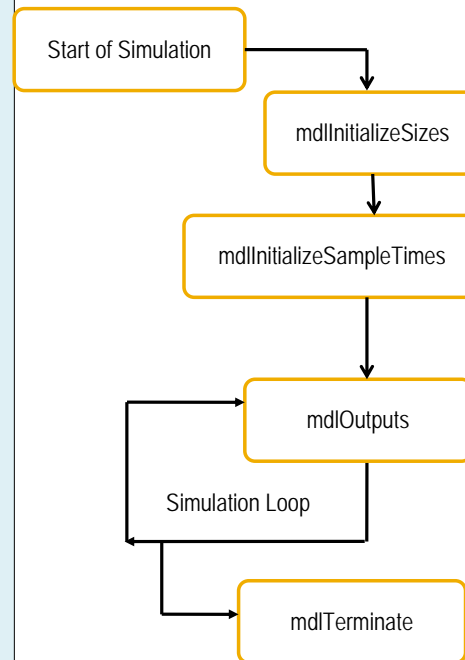
- Improve the existing software that the exoskeleton arms use by adding file input and output functionality
- The program must run at a speed that is fast enough to record the needed data, but slow enough to write to file correctly

Benefits

- Allows the information to be stored to the hard drive rather than in memory
- Limitations on the amount of data recorded are no longer necessary
- Allow patients to store their results and then able to compare them over time

Methods

- Used Matlab's Simulink and the C programming language to modify the current program the arms are running
- Uploaded modified code to target PC connected to the exoskeleton arms
- Tested for errors and correct outputs using rigorous error checking
- Implemented buffer to prevent crash when writing to a file on the target PC
- Slowed write speed from 1000Hz to 100Hz



Execution sequence of the program

Results

- Effectively implemented writing to file portion of the program
- Can read one full second worth of data from file and can output to another file
- Speed of writing may be too slow to be useful
- In the future try to modify entire structure of the program rather than just adding to it

Applications

- The arms could be used by a stroke patient to help in the rehabilitation process
- The data generated from the specific session could then be output to a text file
- The results could then be used to assess the patient's overall progress by comparing the different sessions
- This would allow both the patient and the physician to easily examine the progress using raw data
- This would allow for more accurate data to determine the patient's overall health

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