

Abstract

Abstract: From infancy, our motor behavior is conditioned to respond to and adapt to verbal, visual and tactile cues. These reactions occur in two ways. The first way is cognitive responses. The other is motor responses. In this context, motor learning has been widely used in many mechanisms in recent years. In this study was studied 5 link manipulandum

Introduction

Motor learning is a broad term that covers a wide variety of approaches. It is defined as improvements in performance based on experimentation and learning. motor learning is provided with practice in business areas such as physiotherapists, musicians, dancers, athletes, pilots, sports coaches and animal trainers. The most important factor in this increase is the inclusion of technological methods in therapies. More recently, the use of robotics explored interfaces to facilitate neurorehabilitation. These interfaces mostly focused on human motor control, manipulated motor control and motor learning. Robots provide force-feedback and force-based control as neurorehabilitation devices. Adapts the needs of patients for different characteristics with force-based control algorithms used in rehabilitation scenarios . Music therapy has a wide range of uses such as psychological disease, cancer and endocrine system. Music stimulates the centers related to thinking, learning, speech and body control in the central nervous system and brain shell and supports the developments in this field. this experiment investigates how human adaptation occurs for different tasks .and the role of music in rehabilitation with robot and human interaction

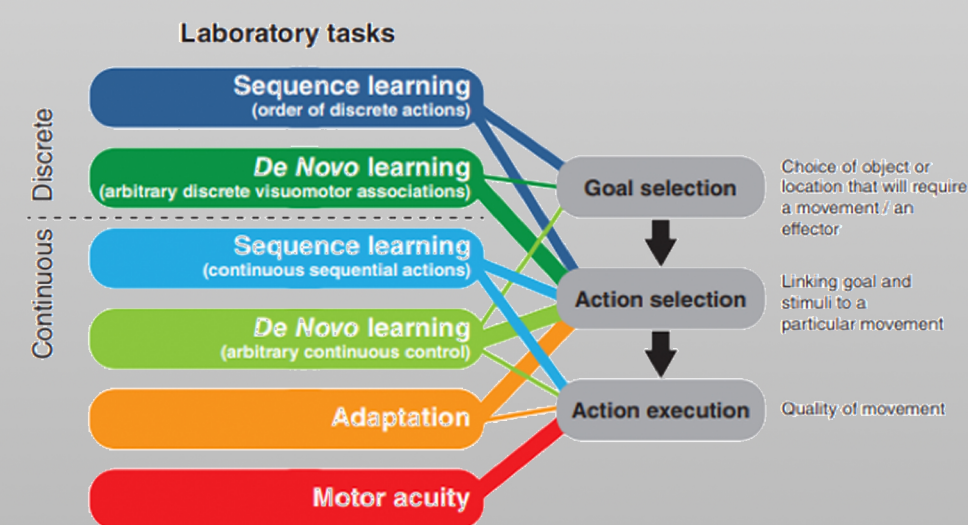


Figure 1- Motor learning tasks

Conceptual Design

In literature there are plenty of examples of manipulandum robots. They have some differences and similarities. According to the aim of the project, adaptation, movement, target detection motivation and kinematic analysis are chosen as design parameters

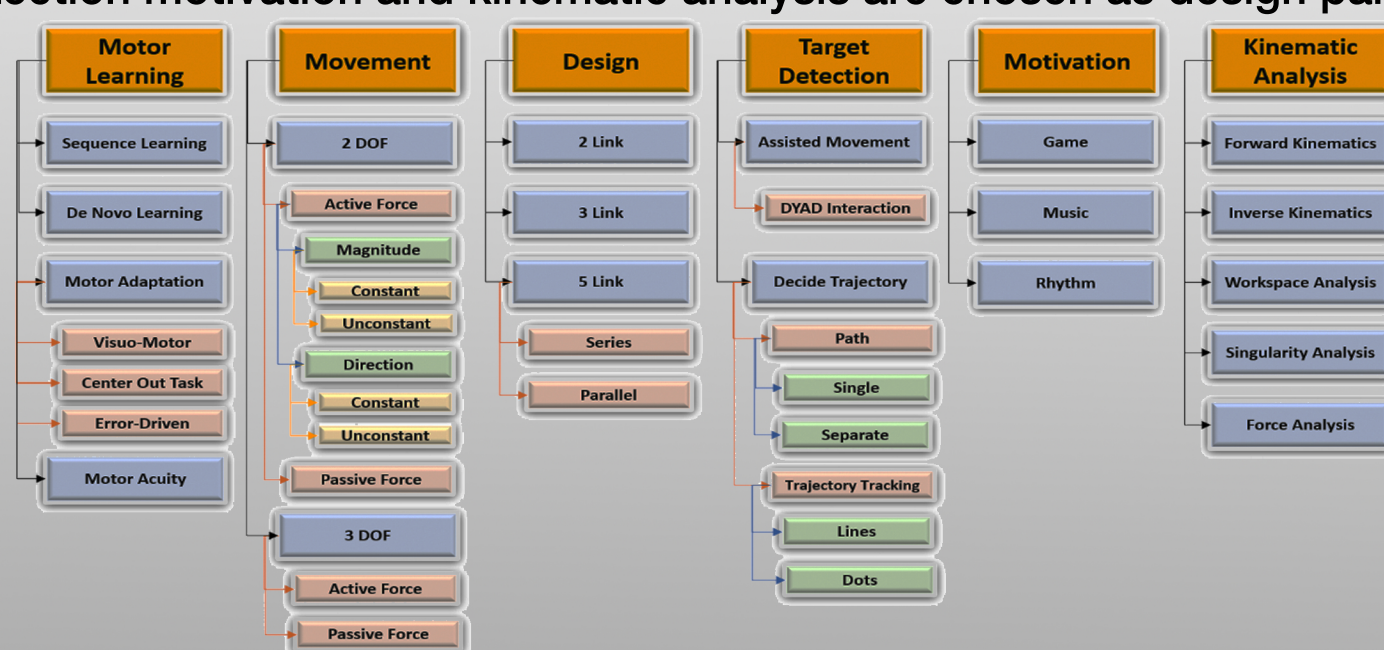


Table 1- Designing human interaction manipulandum robot-Decision Tree

According to the aim of the project, adaptation, movement, target detection motivation and kinematic analysis are chosen as design parameters The inverse kinematic solution was used in the studies for the working area of robot. In fact, given the coordinates (X, Y) of any point in the region, it can be determined by verifying whether it belongs to the study area or not, whether there is at least one solution for θ_{a1} and θ_{a2} . Analyzing the workspace is an important issue when designing robots, especially in determining link lengths to satisfy specific workspaces. In the project, a 15 cm*16 cm rectangle was determined as the workspace

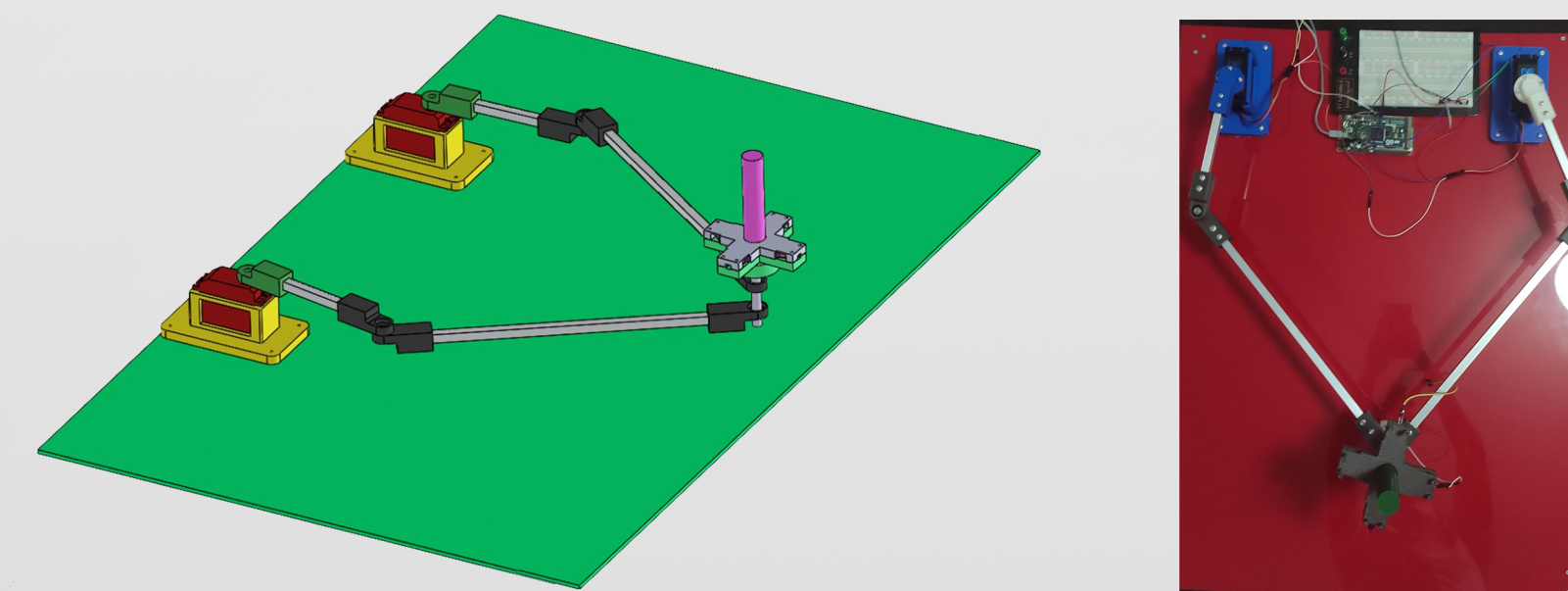


Figure 2 and 3- Three dimensional model of the system

Design Criteria

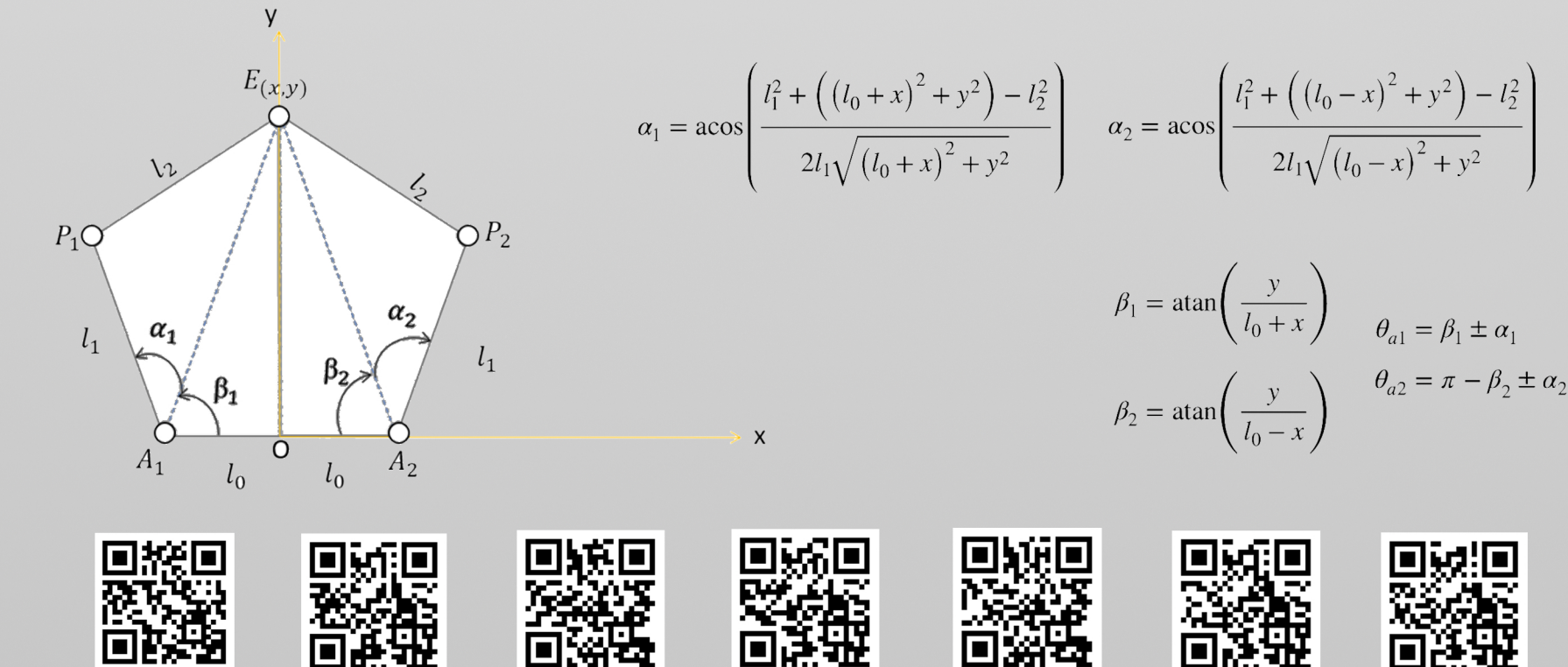
The workspace encloses a rectangle of $L_w \times h_w$

$$\sqrt{R^2 - \left(\frac{2L_0 + L_w}{2}\right)^2} - \sqrt{r^2 - \left(\frac{2L_0 - L_w}{2}\right)^2} = h_w$$

Link	L_0	L_1	L_2
Length(mm)	200	180	390
Cross-Section(mm)	-	10*10	10*10
Material	-	Aluminum	Aluminum
Thickness(mm)	-	1	1

Table 2- Links and properties

Inverse Kinematic



QR Codes- Parts of 3D models

Methods

One of the most important steps required for motor selection was to make a Torque analysis of the system. In this context, the work drawn with SolidWorks was transferred to the Simulink program. Torque analyzes made with 10N force applied in X and Y planes using Simulink. According to the system, cascade controller was designed

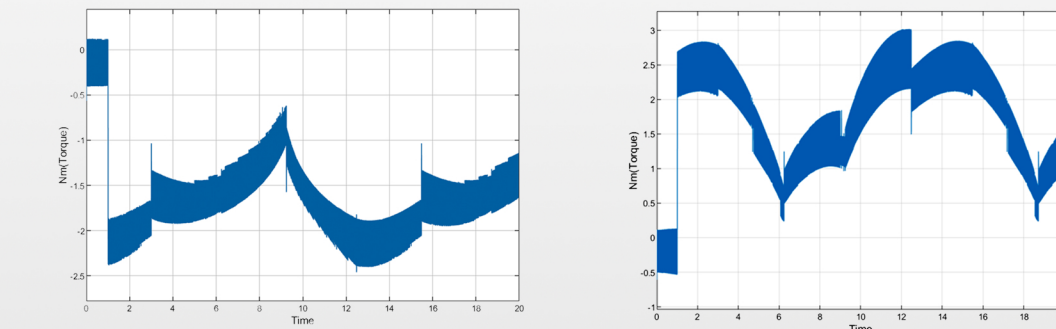


Figure 4- Torque-time graph of the motors

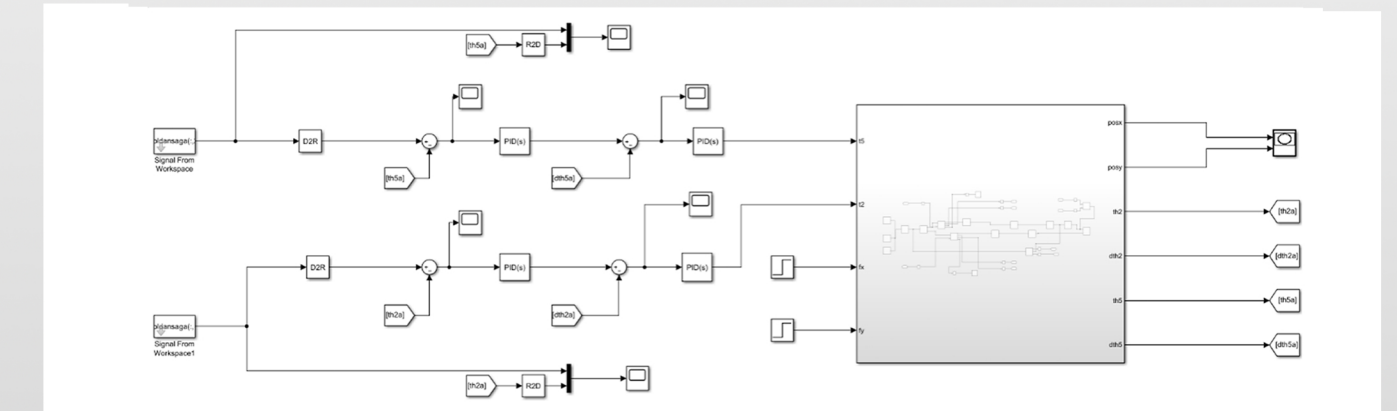


Figure 5- Simulink - Cascade controller system

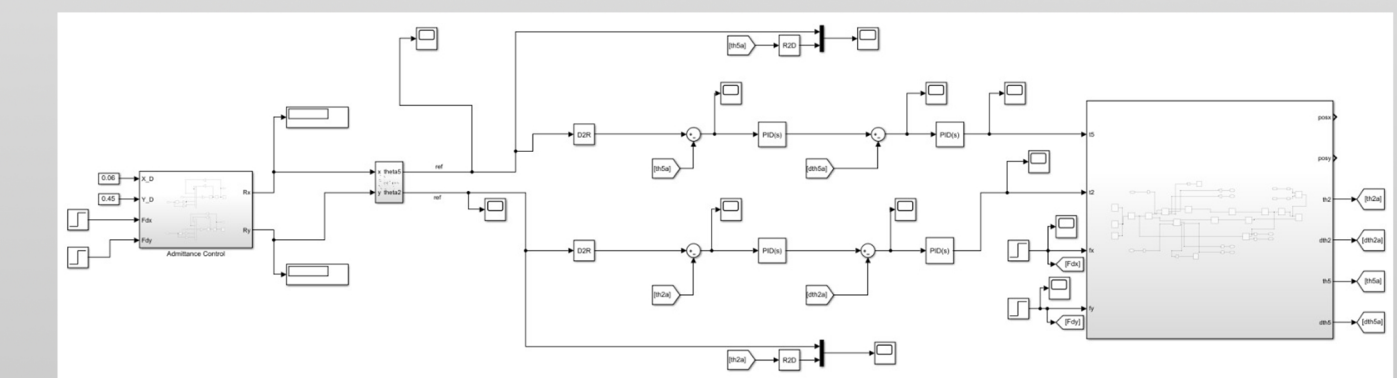


Figure 6- Simulink - Admittance control system

Path Design

With the help of Simulink, different path alternatives were revealed based on the workspace area. Vr-sink block is used on Simulink. And the drawing was drawn via V-realm .Builder 2.0

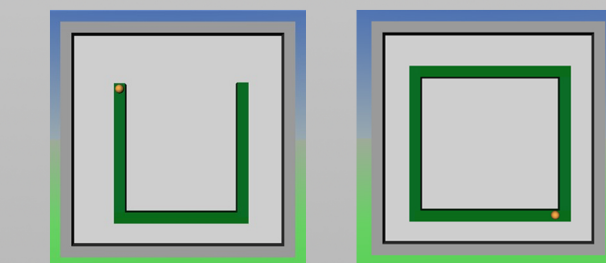


Figure 6 and 7- Alternative path design for users

Conclusion and Future Work

Manipulandum robot control is designed in order to increase adaptation ability. According to the literature, the success of the participant is expected to increase as the number of trials increases. At the same time, the rhythm effect is one of the results obtained from the literature that it is an effective factor in the acceleration of adaptation activities. Experiment results will be created as a result of evaluating the outputs from .the force sensor on matlab

Acknowledgement

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Referances



Report

