

Introduction

The Robot Rec Room is an animatronic exhibit for Dreamwalk at the University Place Mall in Orem. Dreamwalk wanted to populate one of the rooms with multiple animatronic robots that perform simple, repetitive, and interesting motions throughout the day.

Objectives

We were tasked with the design of four simple robots. Each is to perform a specific, unique motion:

- 1. A robot playing Tug of war with a tentacle monster
- 2. A robotic bartender rotating around the center of a table to interact with a patron robot
- 3. A robot simulating the motion of a drunk patron (Tipsybot)
- 4. A mechanism to move a 8' by 4' pinscreen onto a face in the wall

<u>Methods</u>

In all four robot we used 8020 aluminum to build the structural frame. 8020 allows for easy assembly and many attachment points for artists to attach cosmetic items. The motion of the robots will be controlled by dc motors (~3000 oz*in)connected to gears and four bar linkages. The motors will be controlled with a motor controller and an arduino mega.

The tug of war robot incorporated a four bar linkage to move the arms and allow for a tugging motion. The legs will be static at the ankles, but springs in the knees will allow for motion and create a lifelike tug of war motion.

Tipsybot creates the motion of a drunkard swaying on a bar seat. It has a crank-rocker four bar linkage that creates the swaying motion. It will be attached to the bar seat and the legs will not move.

The Bartender uses two motors to drive a set of wheels to rotate about a 1.524 m radius. IR interrupt sensor and coded logic are used to control the movement, and stopping points of the bartender. An actuator and gripper allows The Bartender to grab and place an object.

The gatekeeper robot involved using a type of four bar linkage known as a crank slider. This slider would allow the pinscreen to move back and forth. The structure around the pinscreen would have wheels attached to it to allow this motion to occur without excessive friction.

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Advisor: Professor Stephen A. Massacro Sponsor: Dreamwalk







Tipsybot





The Bartender





The Gatekeeper





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Results

Metric	Target Value	Units	Me V
Tipsybot elbow angle from minimum to maxim angle	0-70 +-5	deg	
Tipsybot elbow cycle tim	<2	sec	
Tipsybot torso angle	0-55 +-5	deg	
Tipsybot torso cycle time	<10	sec	
Tug of War bot range of arm motion	12.7	cm	
Tug of War Bot cycle time	3	sec	
Tug of War bot Knee angle	0-70 +-5	deg	
Radius of Bartender rotation	1.524 +- .15	m	1
Bartender travel angle	300 +-1	deg	
Bartender rotation mechanism stopping distance	<7.62	cm	3
Gatekeeper range of motion	30.48	cm	3
Gatekeeper support a pinscreen	2.44 x 1.22	m	2.4
Gatekeeper support the weight of the pinscreen	68	kg	

The current of each robot was measured with a multimeter to ensure that they could run continuously without damaging the motors. Below is a graph of current measurements for each robot vs time. The continuous running current for the DC motors used in each robot is marked as a solid line at 2.0 A.



Conclusion

- The robots satisfied all design specifications
- All of the robots operate under the continuous current enough to run without damaging the motors.
- All robots are in the process of being installed at Dreamwalk





