The Harkonnen are Attacking!

RTOS Project

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Intro

Basic idea:

To model the physics behind a simple mechanics problem, with some environmental inputs that will affect the physics, with inputs from our SDK affecting the system and with the physical state represented in graphics and LEDs on our SDK.

One of the great advantages to our use of the SDK to simulate physics is that we can have ideal conditions (and thereby avoid “real physics” when it would be very difficult (e.g. friction that complicates things); instant response to inputs; configurable gravity, mass, forcing capability, etc).

The basic challenge:

> Using the slider, force a platform left or right to try to bounce a Harkonnen Mass (hereafter: HM) higher and higher in your “canyon” (the LCD screen), until it leaves the top of the screen and presumably is then more of a problem for the Harkonnen fleet, hovering just out of sight above us. More kinetic energy is imparted by your platform’s Holtzman field if you pulse the field by hitting the left button within a short interval before impact on the platform and holding it long enough for the bounce moment—but the enhanced shield can only stay active for a short time before it must be inactive for a period of time (which it automatically enters when the button is released). If the HM hits the platform without a shield enhancement at a sufficient vertical speed, the mass will lose some momentum but will still bounce upwards thanks to the normal shield. If the mass hits your platform’s shield (normal or enhanced) at too small a vertical speed, it drops right through your shield, hits your platform (at the bottom of the screen), and you lose. Also if you miss an HM altogether with your platform, the debris from the impact on the ground will render you defenseless to Harkonnen ground troops who will follow the bombardment. The

right button is used for automatically-aimed laser defense, which can only be used a limited number of times in the game but will obliterate the current HM. When an HM is either shield-ejected or laser-exploded, if the Harkonnens have any remaining then a new mass is immediately dropped into our defensive zone without changing the platform's position and velocity. The winning condition is surviving all of the dropped masses via shield ejection or laser explosion before the moving platform is destroyed or a ground impact occurs. The construction of the platform allows it to bounce off of the canyon walls.

Link to Github

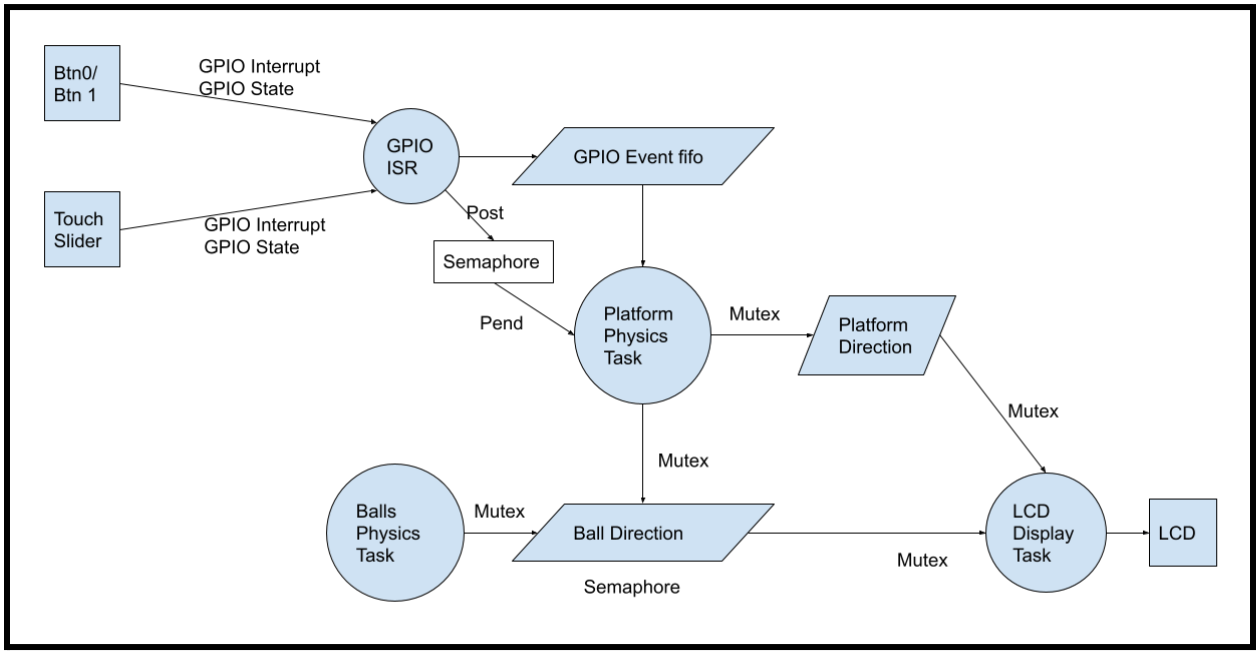
https://github.com/SamuelDiaz970/SDiaz_RTOS_Project

Week 1: Planning

Time Estimates

Estimate	**Actual**
Read project description: 20 minutes	20 minutes
Task Diagram: 1 hour	20 minutes
Unit test Plan: 10 min	10 minutes
Project Stands Statement: 15 minutes	2 minutes
Effort numbers: 30 min	10 minutes
Scope Items: 1 hour	30 minutes
Risk: 10 minutes	10 minutes

Task Diagram



Test Plan

- One of the sections I would like to test the communication between the **Platform Direction** and the **LCD Display Task**
- I also like to test the interaction between **Ball Direction** and **LCD Display Task**

Project Stands Statement

This week I thought through and documented the planning for this project, putting together a task diagram and writing two cutting points for unit testing.

Summary Effort & Estimate Numbers

I have completed 5% of my currently scoped, estimated work (4 / 30 hr) in 66% of the initially estimated time. (3 of 30hr). The best guess of my say/do ratio is 62%, so to unbias my estimates after this class, I may want to multiply my estimates by 1.61 (100%/62%)

No scope changes to report at the current time.

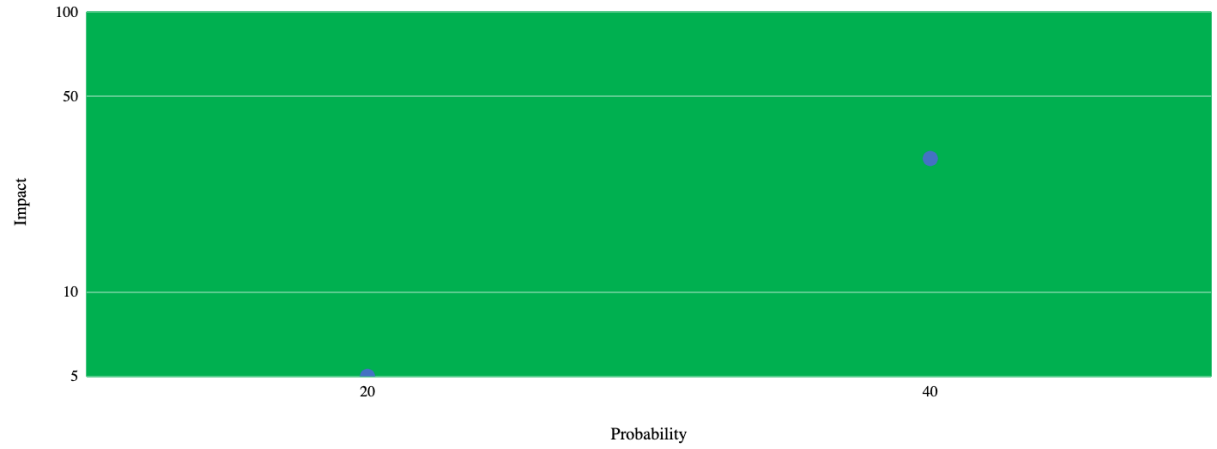
Scope Items

Work Items	Estimated Time (hr)	Actual Time(hr)	Status	Summary Statements
Task Diagram	1	0.5	Complete	Task Diagram consist of all tasks that I considered adding and implementing. More tasks may still be added/removed as the project progresses.
Unit Test Plan	1		In Progress	I wrote two "cut" areas to test.
Overall Planning Document	1		In Progress	The overall document contains all my estimates and plans. I plan on updating this document weekly. I plan on updating it every week.
Create Skeleton Code	2		Not Started	
Create Task Structures and Global Variables	1		Not Started	
Build LCD Task	2		Not Started	
Build Platform Physics Task	3		Not Started	
Build Balls Physics Task	3		Not Started	
Build Mutex, Semaphore, Event Flags	1		Not Started	
Unit Test 1: Input to Physics Task and fifos	3		Not Started	
Unit Test 2: Physics Task to LCD	3		Not Started	
Unit Test 3: Ball Task to	3		Not Started	

LCD				
Debugging	3		Not Started	
Final Functionality and Testing	3		Not Started	
Total	30	0.5		

Risk

Item	P	I	Risk (P*I)	Recognized	Mitigated/ Resolved	ROAM	How
Task Diagram being incorrect	20	5	100	11-Mar-22		O	Planning and Implementation often don't align perfect
LCD Example task not working	40	30	1200	12-Mar-22		O	I will be attending office hours to make sure this isn't an obstacle



Week 2: Planning

Time Estimates

Estimate	Actual
Read project description: 20 minutes	20 minutes
Task Diagram: 1 hour	20 minutes
Unit test Plan: 10 min	10 minutes
Project Planning: 1 hr	1 hour

Test Plan

Testing Type	Cutting Point	Test Name	Status	Summary
Unit	Platform Direction -> LCD Display Task	Correct display of platform on LCD.	In Progress	The platform Direction buffer has been setup, the interaction between the display and that hasn't

				been coded
Unit	Ball Direction -> LCD Display Task	Correct display of platform on LCD.	Not Run	
Unit	GPIO Interrupt -> GPIO Event fifo	Event fifo gets updated from button press	Not Run	
Unit	GPIO Interrupt -> GPIO Event fifo	Button Press queues a timed boost		
Unit	GPIO Interrupt -> GPIO Event fifo	Event fifo gets updated from slider	Not Run	
Unit	Platform Physics -> Platform Direction	Physics updating Platform velocity and position	Not Run	
Unit	Platform Physics -> Ball Direction	Platform Physics updating ball direction after a collision	Not Run	
Unit	Ball Physics -> Ball Direction	Physics updating Ball velocity and position	Not Run	
Unit	BallPhysics -> Ball Direction	Ensure working collisions between the ball and platform		
Unit	End Game	Ensure end game can be reached	Not Run	

Project Stands Statements

As of this week I was able to debug my issue of the LCD not displaying anything. I put together a skeleton code and most of the defines (for tasks, queues, and flags) have been implemented.

Summary Effort & Estimate Numbers

I have completed 20% of my currently scoped, estimated work (6 / 30hr) in 60% of the initially estimated time (5 of 30 hr). My best guess of my say/do ratio is 90%, so to unbias my estimates after this class, I may want to multiply my estimates by 2 to be safe.

No scope changes to report at the current time.

Scope Items

Work Items	Estimated Time (hr)	Actual Time(hr)	Status	Summary Statements

Task Diagram	1	0.5	Complete	Task Diagram consist of all tasks that I considered adding and implementing. More tasks may still be added/removed as the project progresses.
Unit Test Plan	1	1	In Progress	I wrote two "cut" areas to test.
Overall Planning Document	1	2	In Progress	The overall document contains all my estimates and plans. I plan on updating this document weekly. I plan on updating it every week.
Create Skeleton Code	2	1	Complete	Finished skeleton code with empty tasks and queues.
Create Task Structures and Global Variables	1	0.5	Complete	Defined variables for tasks and queues.
Build LCD Task	2	0.5	in Progress	Debugged LCD not displaying issue
Build Platform Physics Task	3		Not Started	
Build Balls Physics Task	3		Not Started	
Build Mutex, Semaphore, Event Flags	1		Not Started	
Unit Test 1: Input to Physics Task and fifos	3		Not Started	
Unit Test 2: Physics Task to LCD	3		Not Started	
Unit Test 3: Ball Task to LCD	3		Not Started	
Final Debugging	3		Not Started	
Final Functionality and Testing	3		Not Started	
Total	30	5.5		

Risk

Item	P	I	Risk (P*I)	Recognized	Mitigated/ Resolved	ROAM	How
Task Diagram being incorrect	20	5	100	11-Mar-22		O	Planning and Implementation often don't align perfect
LCD Example task not working	0	30	0	12-Mar-22	Resolved	R	I solved debugged my error

I will not have enough help to make progress during the break	20	20	400	18-Mar-22		O	I will be sure to hit up the slack as soon as I encounter an obstacle to try to get to the problems as early as possible
I will not be motivated to make progress on the project during break	20	80	1600	19-Mar-22		M	I have scheduled "work hours" to complete the work I have to do