

PROJECT

- **Objective:**

Go through all phases of a project of an embedded system.

Option 1: develop a vintage game, such as Pacman.

Option 2: develop a closed control loop (sense-process-actuate) such as the control of an elevator. Requires either a plant simulator or an actual physical model.

PROJECT

Activities:

1. Select a simple graphical game, such as Pac Man or Space Invaders, that can be played with the LCD, touch and push-buttons available on the S7G2
2. Perform the Development steps of an Embedded System (19-31h)
3. Deliverables
 - a) CONOPS + Specification (4-6h)
 - b) Platform domain study docs (2-4h)
 - c) Design docs (3-6h)
 - d) source files + executable (10-15h)

STEPS IN EMBEDDED DEVELOPMENT

- | | |
|-----|--|
| 1. | Product Concept - CONOPS / Problem Domain Study |
| 2. | Requirements Engineering - Stakeholder Req, Other Req |
| 3. | Systems Engineering - System Req. |
| 4. | Systems Engineering - System Architecture / Platform Domain Study |
| 5. | HW/SW/Mechanical Development Process
Req, Spec., High-level Design, Detailed Design, Implementation/Coding, Unit testing, Integration ... |
| 6. | System Integration |
| 7. | System test |
| 8. | Field test |
| 9. | Acceptance test (Validation) |
| 10. | Documentation (user, production, maintenance, support, ...) |
| 11. | Product packaging - marketing, shipment, ... |

PROJECT - TEMPLATES

Templates for documents:

- a) CONOPS+Specification
- b) Platform domain study docs
- c) Design docs

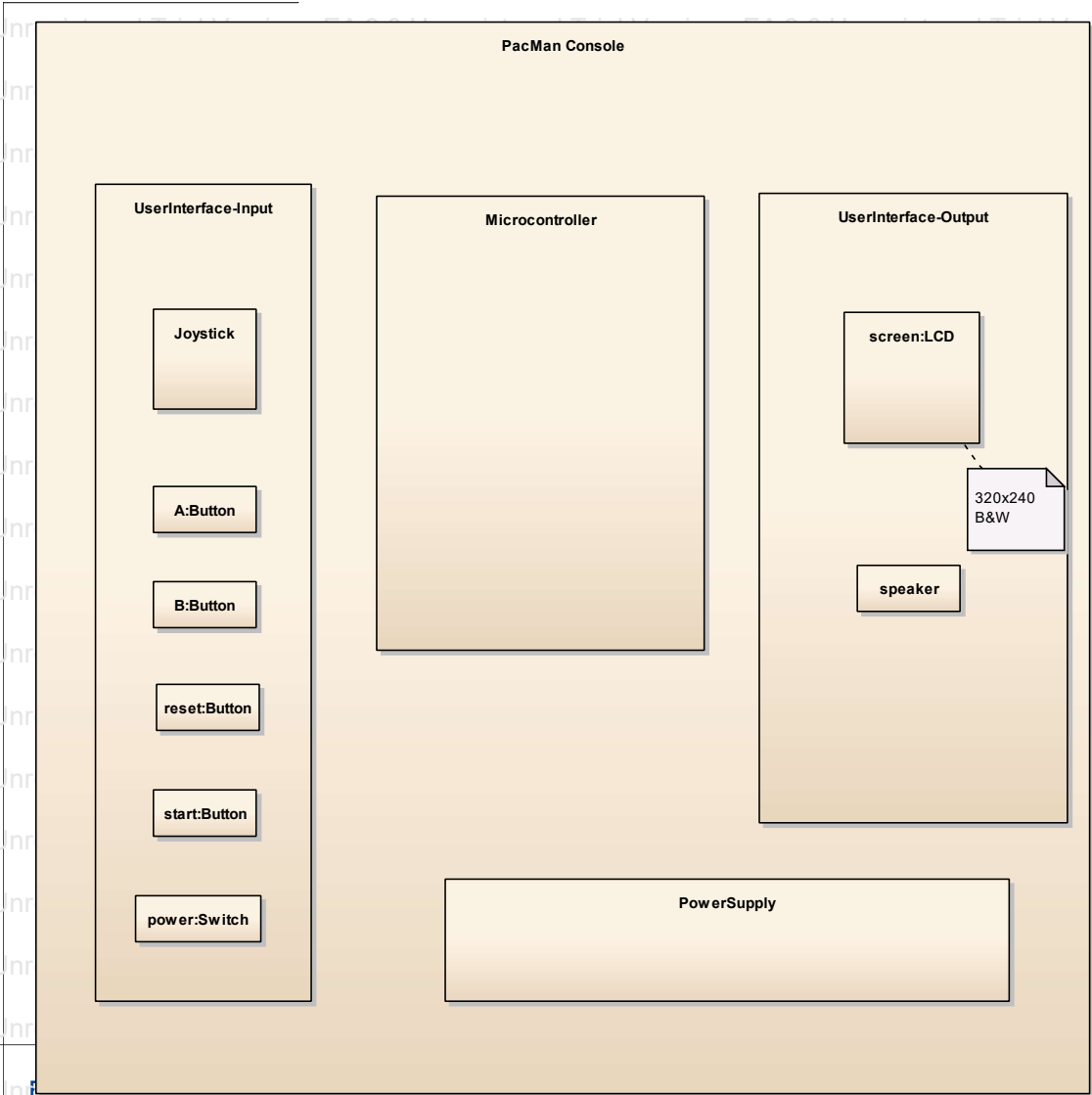
CONOPS

1. Introduction
2. System Description
3. User Interface
4. Stakeholder Requirements
5. Operational Scenarios

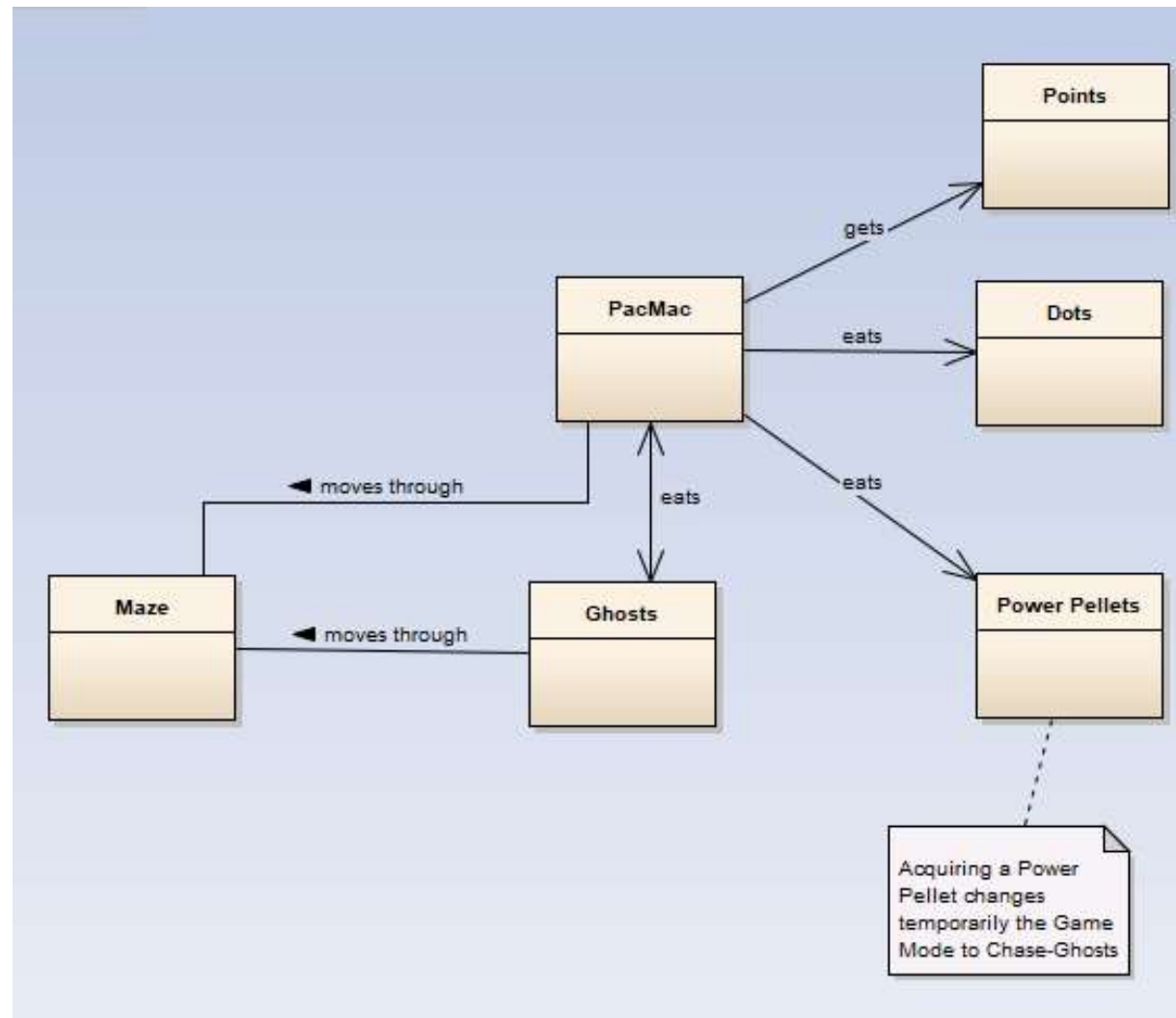
SYSTEM DESCRIPTION - PRELIMINARY PHYSICAL STRUCTURE



2021 Prof. Douglas Renaux



SYSTEM DESCRIPTION - GAME LOGIC



PROBLEM DOMAIN

1. Theory of Arcade Games

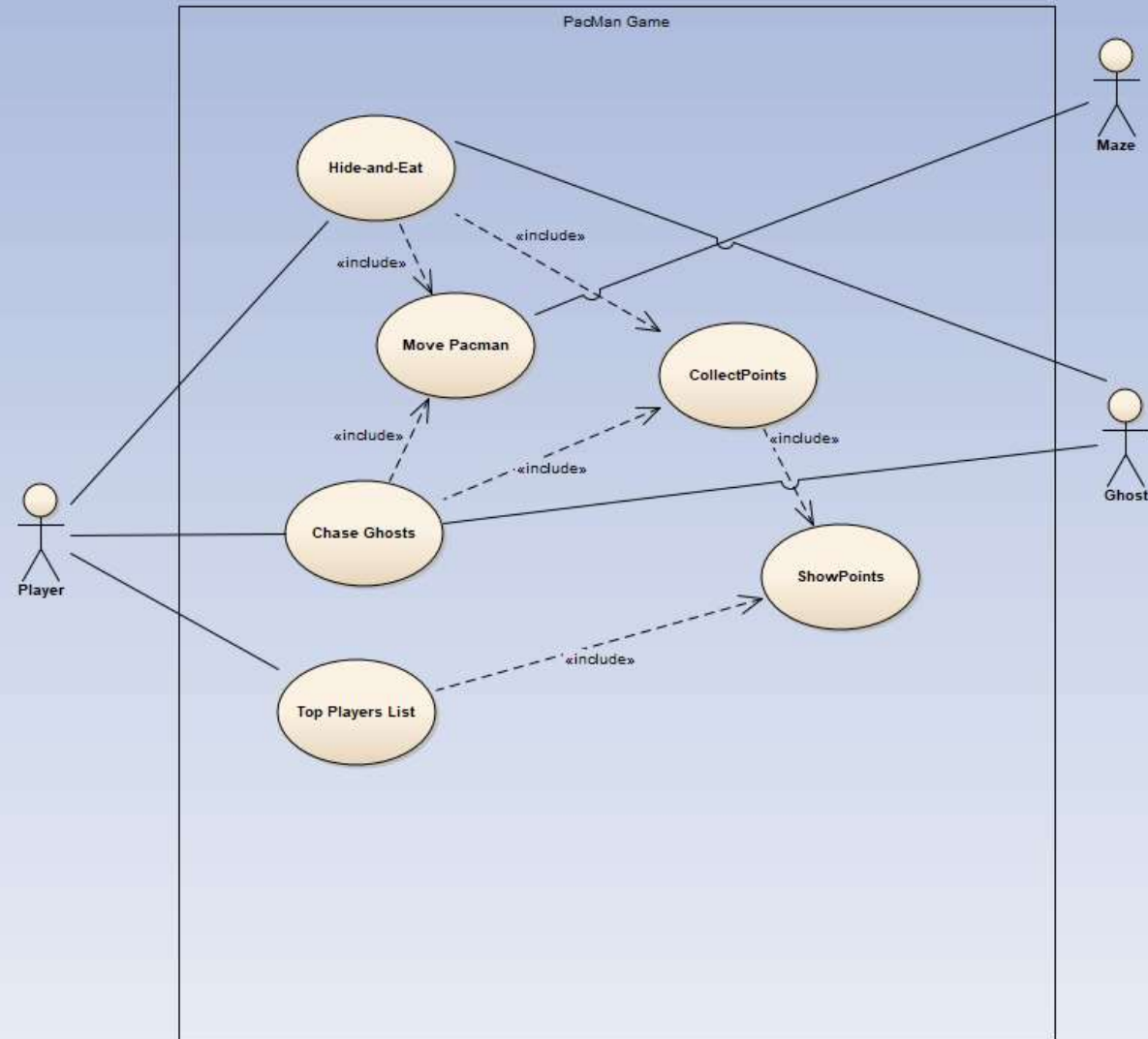
- i. Action games
- ii. Responsiveness

2. Modes

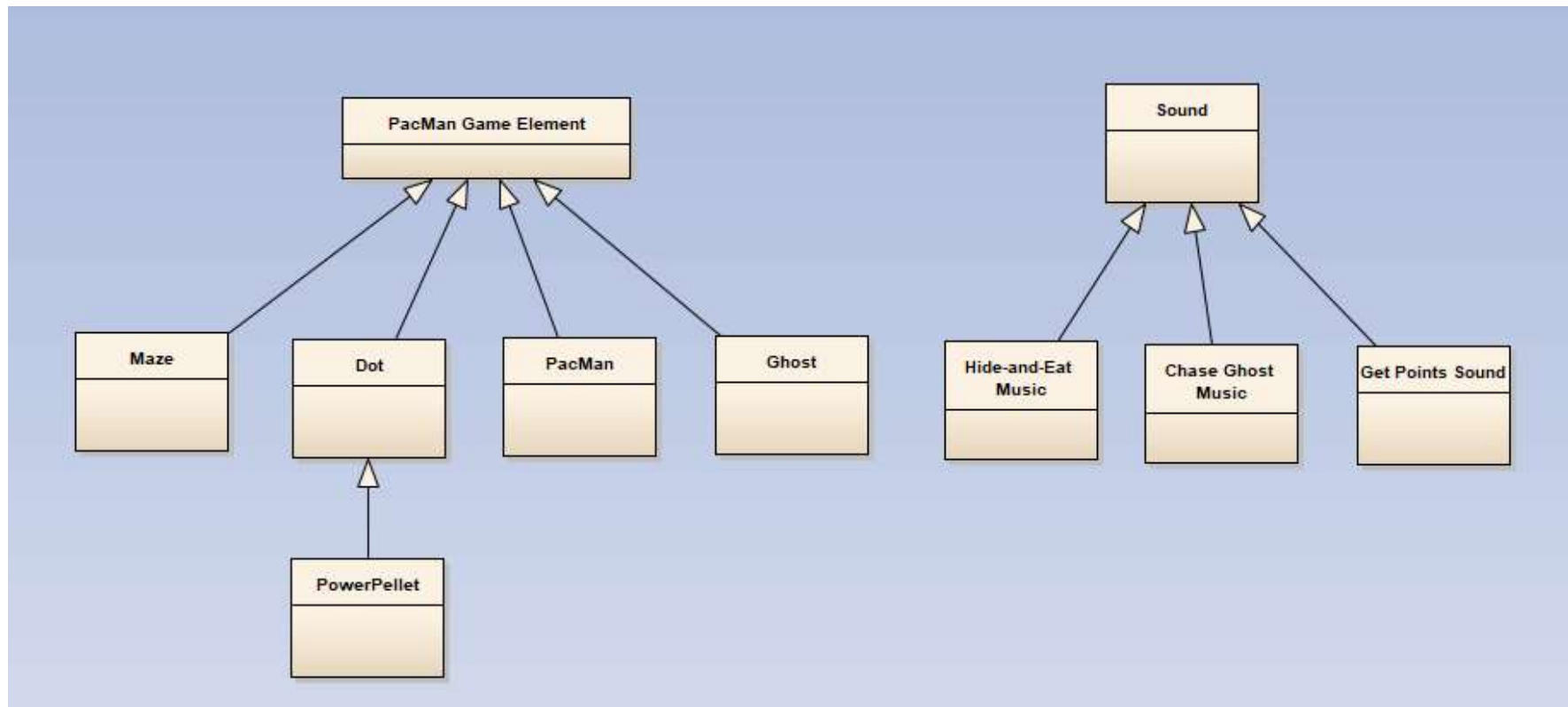
3. Rules

4. Best Players

PROBLEM DOMAIN - USE CASES DIAGRAM



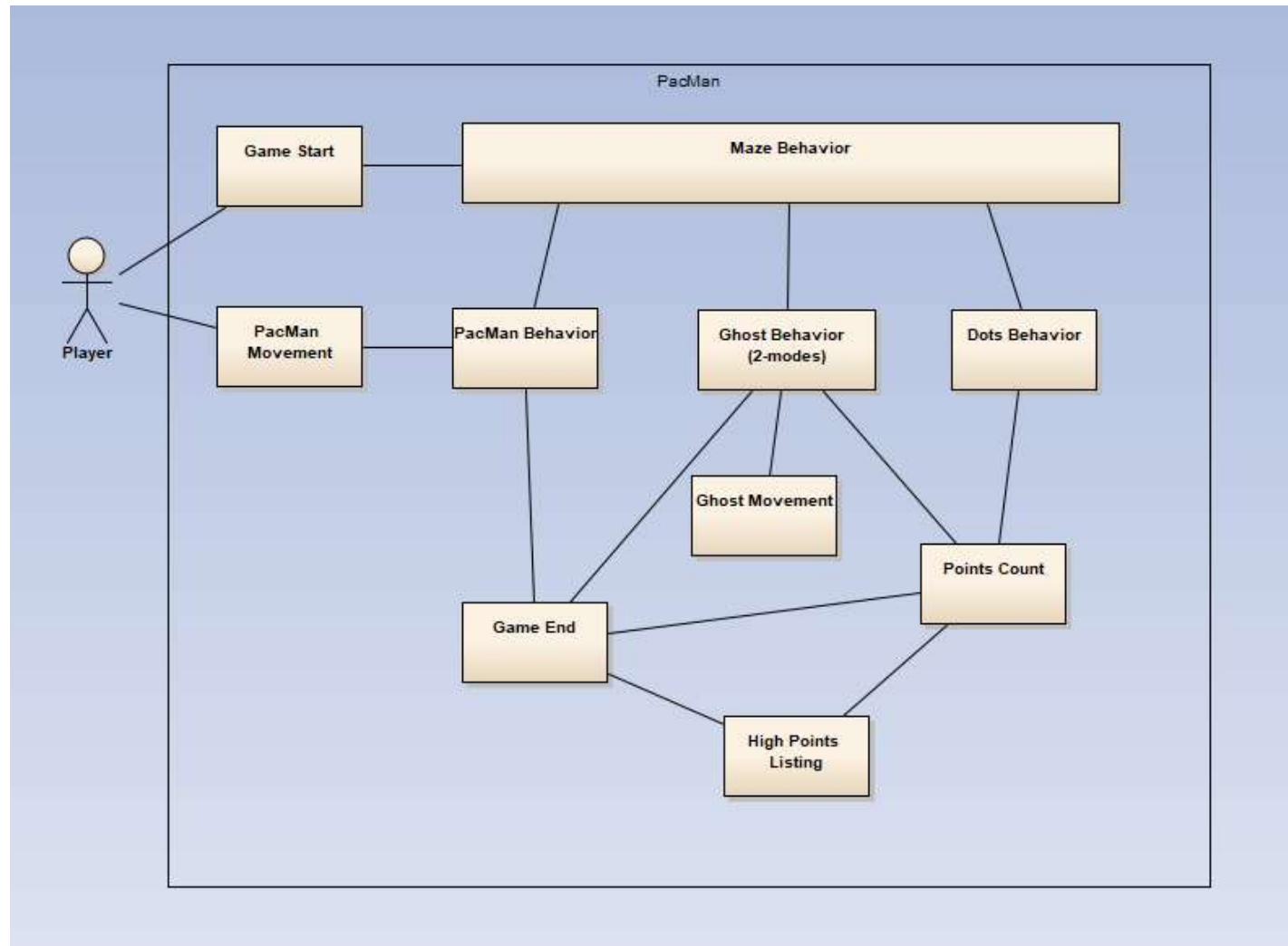
PROBLEM DOMAIN - GAME ELEMENTS



SPECIFICATION

1. Introduction
2. System Structure
3. Functional Architecture
4. Functional Specification
5. Non-Functional Specification
6. Restrictions

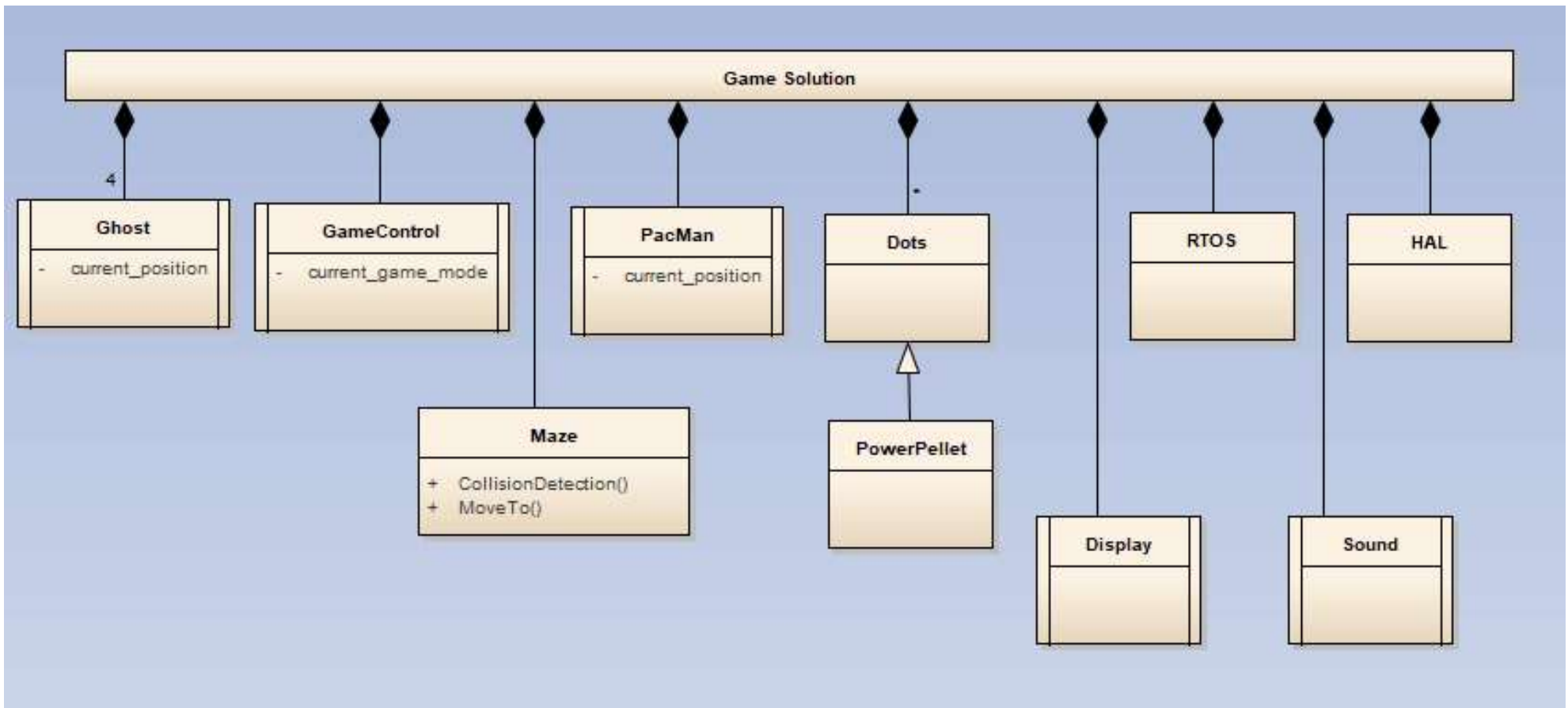
FUNCTIONAL ARCHITECTURE



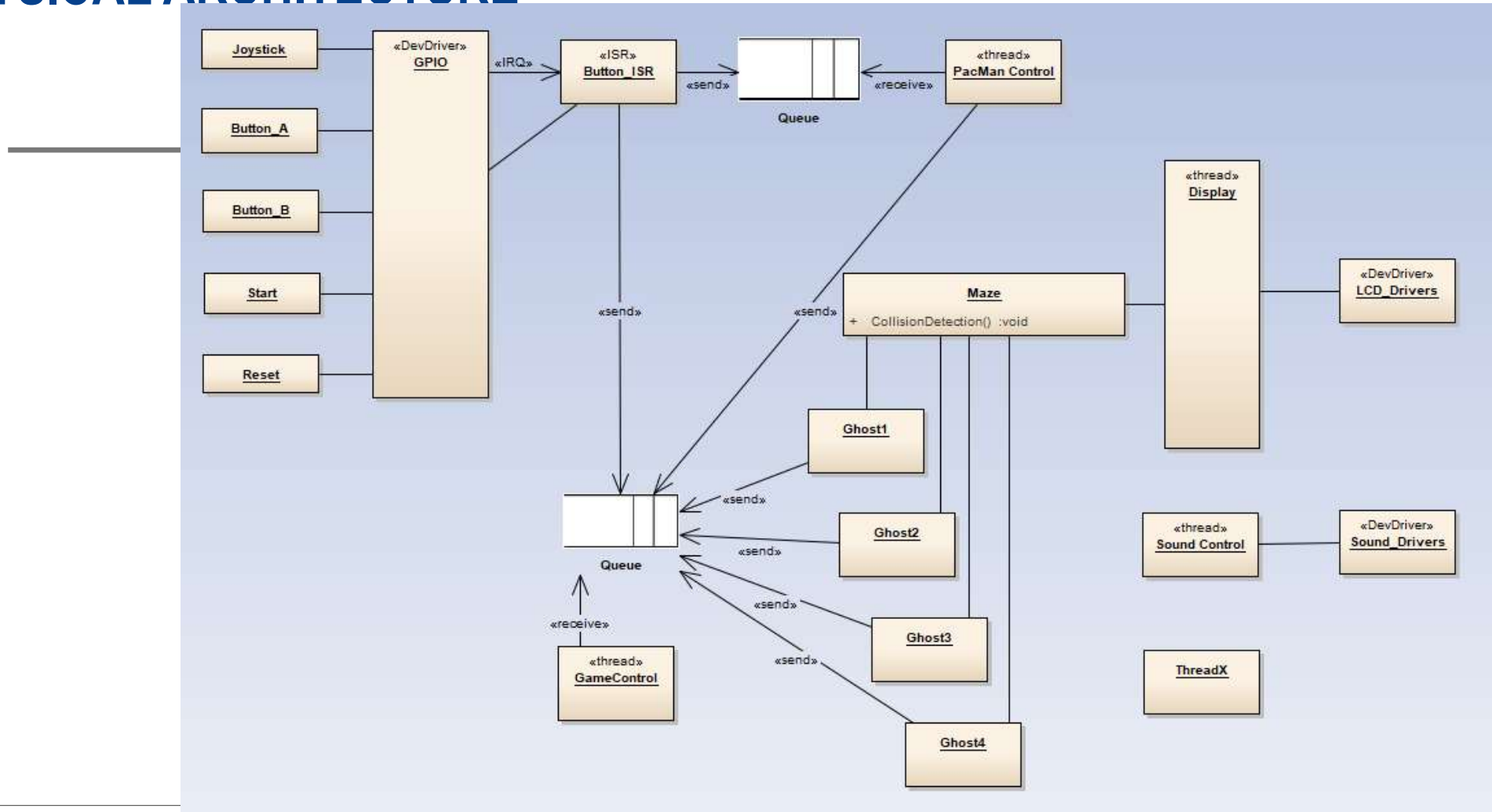
DESIGN DOCUMENT

1. Introduction
2. Functional Architecture
3. Physical Architecture
4. User Interface Design
5. Mapping of Physical Architecture to Functional Architecture
6. Detailed Design

SOLUTION DESIGN - CLASS DIAGRAM



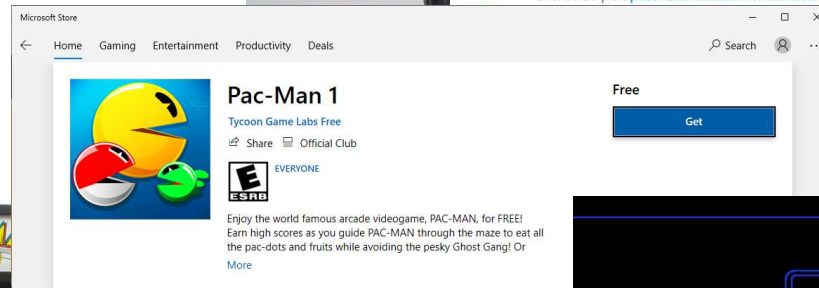
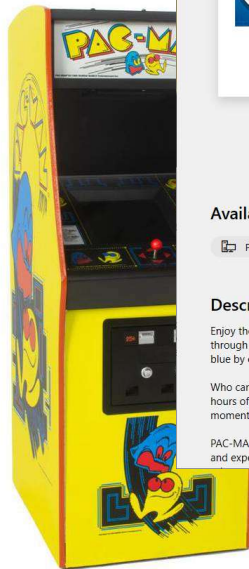
PHYSICAL ARCHITECTURE



MAPPING

Implementation Modules: ->	GPIO	Button_ISR	PacMan Ctrl	Maze	Ghost 1	Ghost 2	Ghost 3	Ghost 4	Game Control	Display	LCD Driver	Sound Ctrl	Sound_Drv	ThreadX
Functionalities:														
GameStart	X	X		X					X					
PacMan Mvm	X	X		X										
Maze Behavior				X	X	X	X	X	X	X	X			
PacMan Bhv				X										
Ghost Behavior				X	X	X	X	X						
Ghost Mvm				X	X	X	X	X						
Dots Behavior				X					X					
Points Count									X					
Game End	X	X							X					
High Points	X	X							X					
Play Sounds									X			X	X	
Change Game Mode									X					

PRODUCT EVOLUTION



Available on



Description

Enjoy the world famous arcade videogame, PAC-MAN, for FREE! Earn high scores as you guide PAC-MAN through the maze to eat all the pac-dots and fruits while avoiding the pesky Ghost Gang! Or turn them blue by eating a power pellet to chomp on them!

Who can forget the retro addictive gameplay of this pop culture icon? Remember all those countless hours of free time and quarters spent at the local arcade back in the 80's? Re-live those classic gaming moments on your Windows!

PAC-MAN is the retro arcade game you know and love, now better than ever before! Join millions of fans and experience this classic along with new features* such as original mazes, weekly tournaments, and



COMPARING IMPLEMENTATIONS

Changes:

- user input
- display resolution
- processing platform: PC, cloud, microcontroller

Same:

- visualization of graphical elements
- game rules