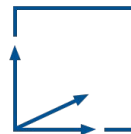


Boss Engineering: Methods and Tools for Game Development

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Introduction

- Bosses are a long standing staple of video games
- They have been essential parts and highlights of games that employ them.
- The creation process is an interdisciplinary endeavor
- The focus is on bosses and their fights

Motivation

- Addressing the process behind bosses
- Exploring the concept of bosses and their components
- Exploring boss design
- Improving and supporting this process

Problem Description: Issues

- The process of boss design is a less utilized design space
- A lack of a clear unified foundation for design and communication
- Tools primarily support the development process but not boss design specifically

Related Work - Game Design

- MDA Framework [1]
- Engineering emergence: applied theory for game design [2]
- Game Design Tools: Can They Improve Game Design Practice? [3]

Related Work - Bosses

- The roles, mechanics and evolution of boss battles in video games [4]
- Understanding boss battles: A case study of cuphead [5]
- A programming model for boss encounters in 2d action games [6]
- Program synthesis as a generative method [7]

Goals of this Thesis

- Starting a foundation for a shared knowledge base, vocabulary and design language
- Describing core concepts of bosses
- Exploring existing ways of displaying bosses
- Creating a prototype tool that supports the boss development process

What is a Boss?

- Strong enemies, opponents or stages in a game
- Unique and often difficult challenges
- Used at pivotal points within the story
- Serve as skill tests and methods to raise tension
- Test, Story and Reward [8]

What is a Boss Fight?

- Often difficult or challenging change of pace
- The encounter between the player and the boss.
- The interaction between the two opposing sides within in a space dedicated to the fight itself
- Adapted structure of a fight: Intro, Display, Challenge, Transition, Test, Reward [8],[9]
- Mechanics: Actions and Phases

Aspects of a Boss Fight

- Time
 - Duration and length of fight
 - Frequency, pace and rest periods
 - Phases
- Space
 - Area of the fight
 - Intended Distances and size differences
 - Obstacles
 - Traversal and movement

Aspects of a Boss Fight

- Player Resources
 - Statistics and attributes
 - Survivability and ability pools
 - Items and abilities
- Boss Resources
 - Health
 - Additional enemies
 - Attacks and patterns
 - Phases

Aspects of a Boss Fight

- Context and Challenge
 - General game properties like the role and story
 - Difficulty and challenge level
 - Type of boss
 - Amount of participants
 - Restrictions

Categories of a Boss Fight

- Patterns
 - All possible actions
 - Random versus fixed pattern [10]
 - Repeated set of patterns deployed in a specific way
 - Randomized attacks the boss chooses from
- Match-up
 - Amount of participants
 - One boss to multiple bosses
 - One player to large groups of players

Categories of a Boss Fight

- Purpose
 - Combatant
 - Mechanics are predominantly designed around fights
 - Combat encounter
 - Boss as a Puzzle or Level
 - Deploy puzzles or levels as part of the fight
 - Boss can be a puzzle or level
 - Can be used in combination with Combatant

Modeling a Boss - Existing Options

- Statecharts [11]
 - Capable of in-depth and complex descriptions of the behavior and components of a boss fight
 - Complex interactions are able to be shown through concurrency, communication and subsidiary states
 - Design and progression of a fight are harder to display
- UML
 - State and activity diagrams display behavior
 - Class diagrams can model the boss itself
 - Sequence and communication diagrams represent the fight and its components
 - Logical and mechanical components can be addressed
 - Design can be displayed up to a certain extent

Modeling a Boss - Existing Options

- Machinations [2],[12]
 - Formal framework for displaying and simulate a game's internal economy
 - Visualization tool based on diagrams that represents mechanics and connections
 - Primarily showcases the flow of resources between nodes
 - Bosses can be visualized and simulated concerning their game mechanics
 - Provided statistics by Machinations can also help with analyzing the fight
 - Design choices can only be displayed up to a certain extent

The Boss Board - Motivation

- Assist the creation and design process
- Contribute to a unified design language
- Assist the prototype stage of development
- Aid the discussion and communication through a design language

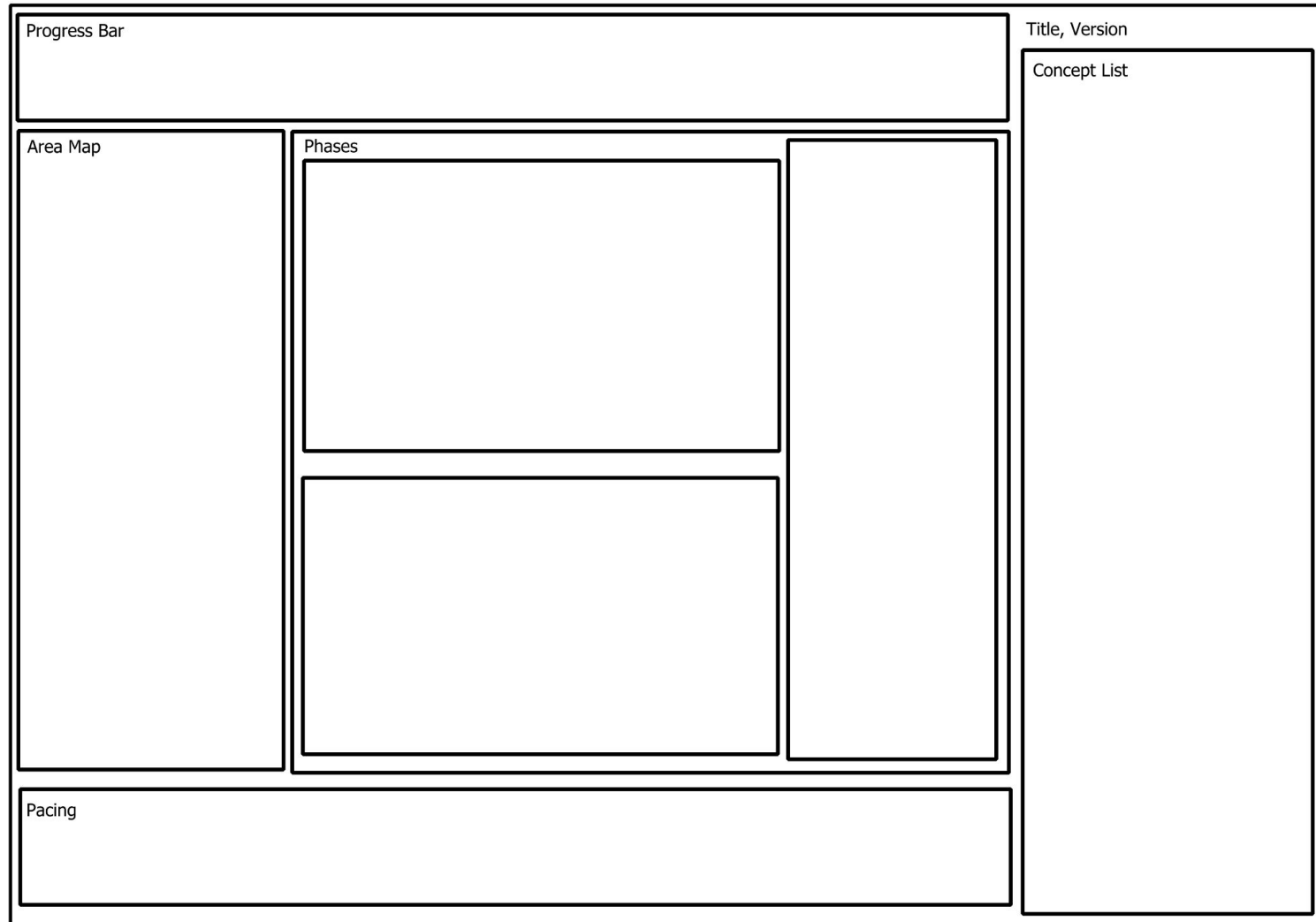
The Boss Board - Intent

- Present models of bosses and their fight
- Offer an iterative design environment
- Prototyping bosses according to a predefined notation
- Visualize a boss and all its components clearly and within one space similar to a One-Page Design [13]

The Boss Board - Core Principles

- Visualize and evaluate a boss and its fight
- Foster conscious and intended design
- Specific zones for each component
- A modular nature through choices and optional components
- Interconnected board of zones, parts and components

The Boss Board

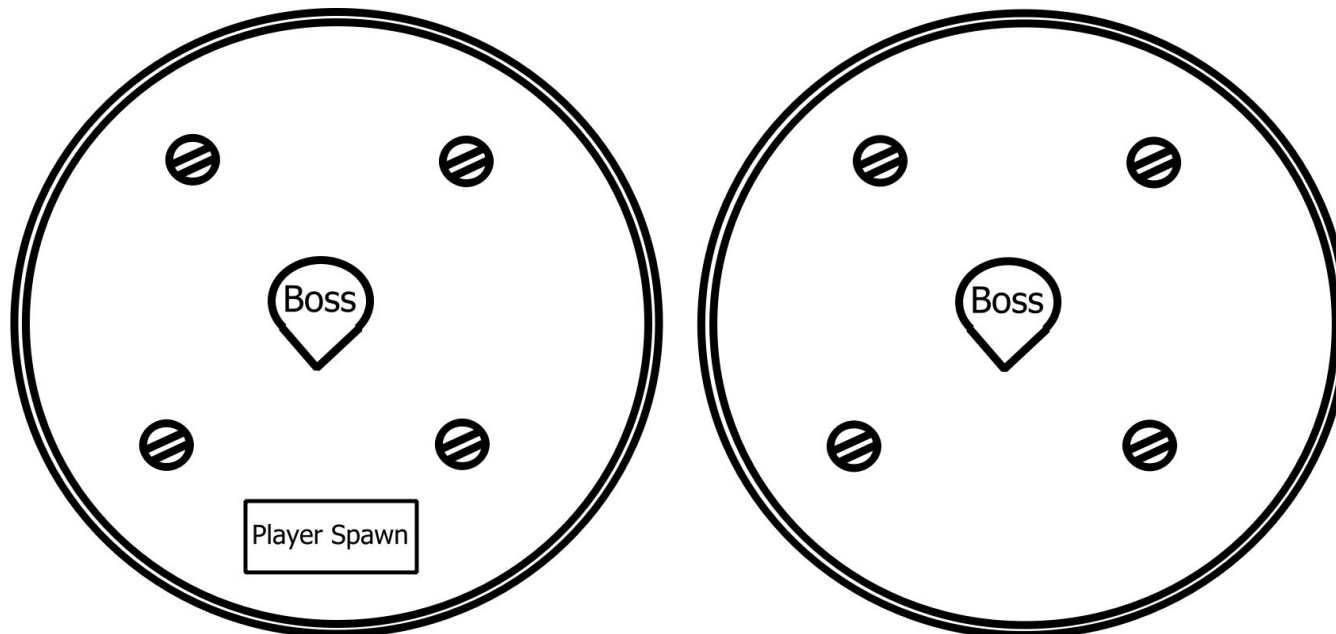


The Boss Board - General Components

- Zones
 - Distinct areas that represent individual parts of a fight
- Transitions
 - Arrows and lines connecting elements within and between zones
- Markers and Tokens
 - Identifiers and numbers corresponding to specific components on the board
 - Event points signify important events that happen during a fight and are placed throughout the board
- Icons and symbols
 - Represent player and boss resources, as well as their addition and removal
 - Also represent time instances and effects on player and boss

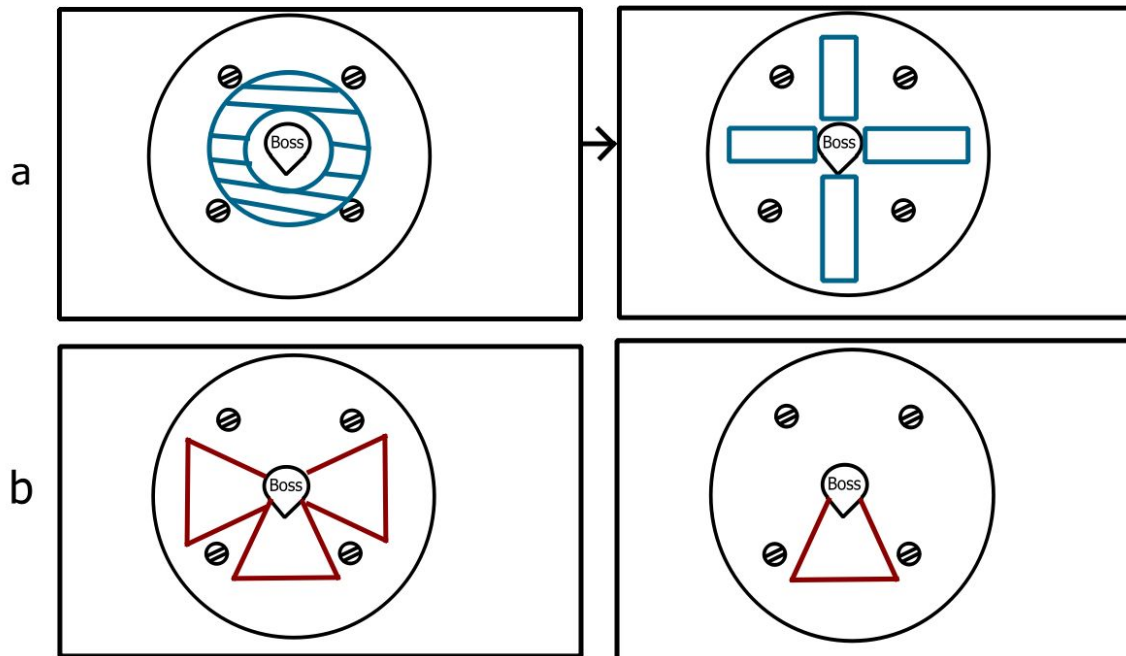
The Boss Board - Area Zone

- Sets the area, dimension, perspectives and obstacles of a fight
- Marks the starting position of entities and any changes



The Boss Board - Phase Zone

- Phases mark distinct stages of a fight
- They include actions and attacks that the boss can perform

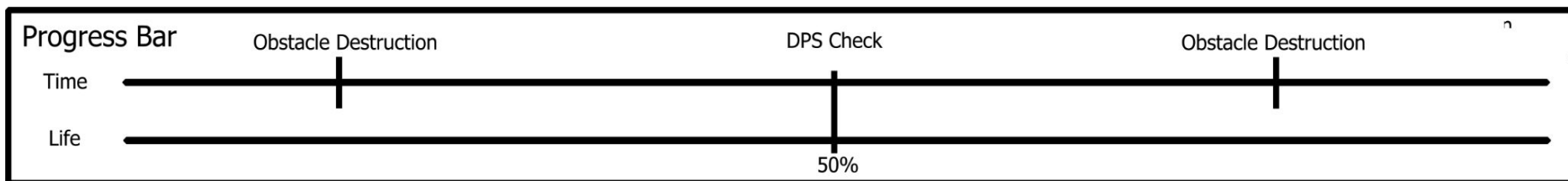


The Boss Board - Pacing Zone

- Can be part of the Phase Zone or used independently
- Describes the behavior of the boss and rest periods throughout the fight
- Can be used with icons and symbols or text descriptions

The Boss Board - Progress Bar

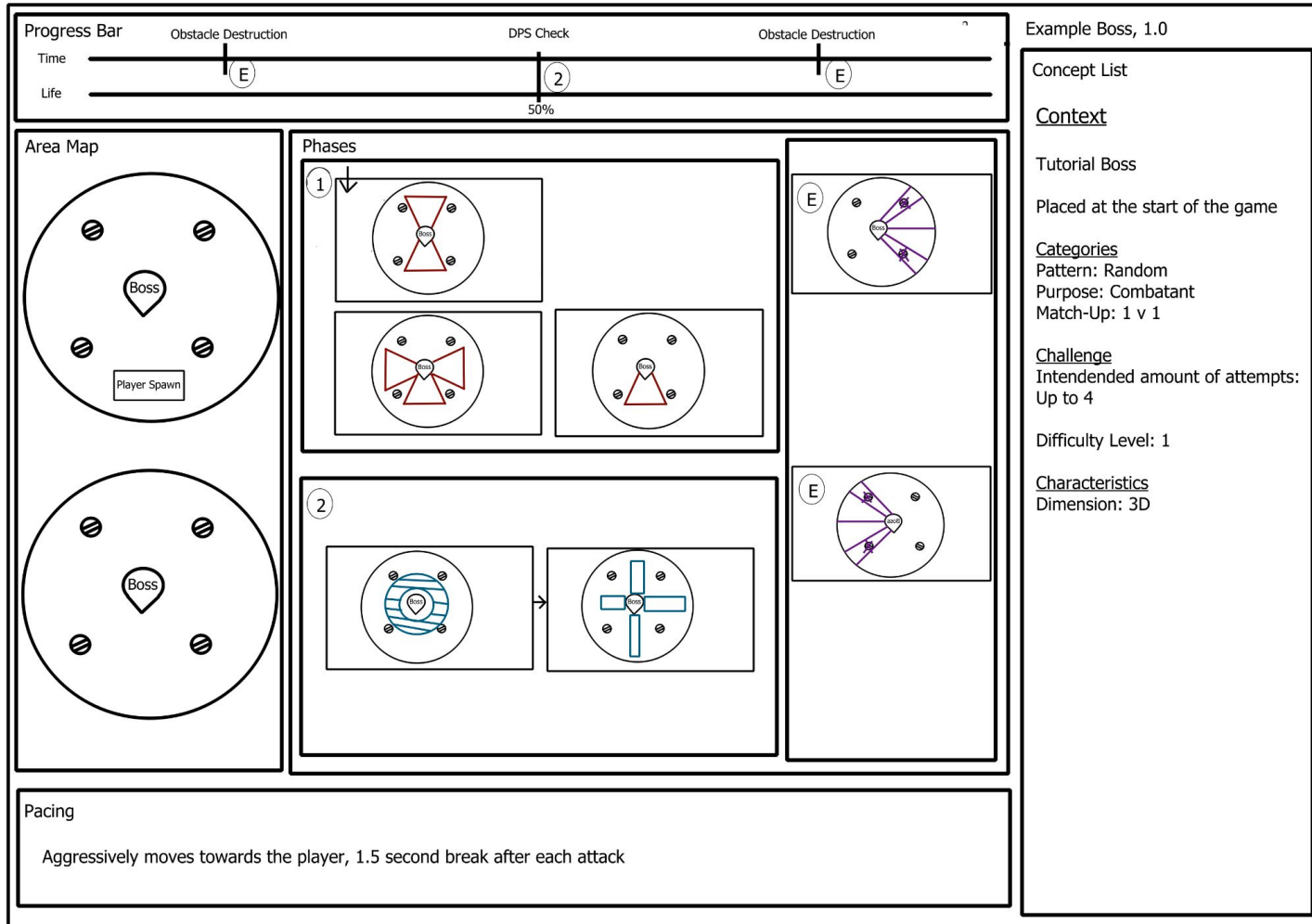
- Depicts the overall progression of the fight by using events and milestones
- Timeline
 - Used as a rough outline for how a fight is supposed to progress
 - Tracks time sensitive events
- Lifeline
 - The health of the boss throughout the fight
 - Certain milestones or events are triggered by reaching a certain amount of health



The Boss Board - Concept Zone

- Context
 - Role, theme and story of the boss
 - Placement within the game
- Categories
 - Pattern, Purpose and Match-up
- Challenge
 - Amount of attempts, difficulty level of the fight
- Characteristics
 - Any additional information
 - Noteworthy mechanics
 - Prerequisites and rewards

The Boss Board



Discussion

- The groundwork was done to create a knowledge base and vocabulary. Further elaborations and more precise details are needed.
- The concept of boss fights can be applied on existing tools but these are more oriented towards game mechanics than general boss design.

Discussion

- The Boss Board delivers an easy overview in one place.
- Potentially fosters easier communication
- Offers a variety of options, alternatives and modularity
- Less precise visualization and notation
- More geared towards action genre

Discussion

- Less precise in displaying mechanics in heavy detail
- Walks the line between oversimplification and adding unnecessary complexity
- Sets enough limitations and guidelines to provide a base but leaves room for creative process.

Suggested Future Work

- Turning the presented prototype into a useable digital and/or physical tool
- Testing and researching the actual need and use case of a boss design tool
- Combining the tool with methods for testing the model through processes like simulation and unit tests.

Suggested Future Work

- Existing work like Game Design Patterns [14] could be used to create patterns for bosses that aid in creating a boss design language
- Exploring the connection between boss fights and difficulty, challenge and flow could contribute to a boss design language

Conclusion

- An attempt was made to create a design language for bosses through a shared knowledge base and vocabulary.
- A collection of aspects, categories and principles was provided
- The Boss Board was created as a simple tool with a visualization notation that offers guidelines while leaving room for individual adjustments

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Thank you