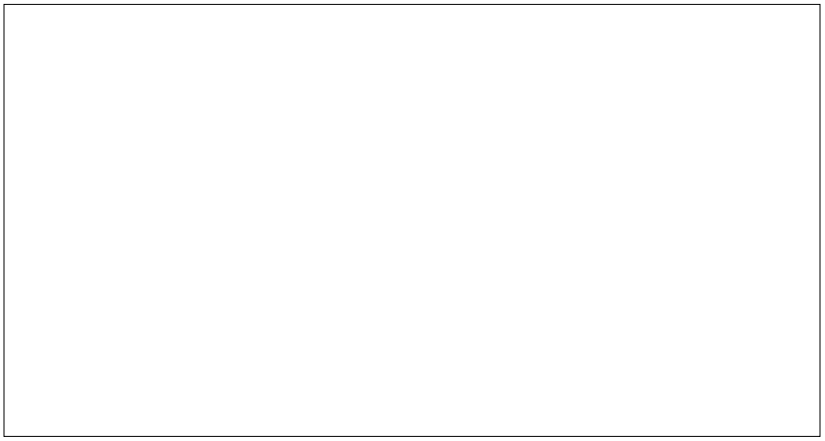
# Game Development



# What is a game?



# Books/Movie vs. Game

Good books have
- Place
- Era
- Plot
- Characters
- Relationships

And so do games?

What is the difference?



# Toy/Puzzle vs. Game

- Is a toy a game?
- Is a puzzle a game?

## Toy/Puzzle vs. Game

- Is a toy a game?
- Is a puzzle a game?

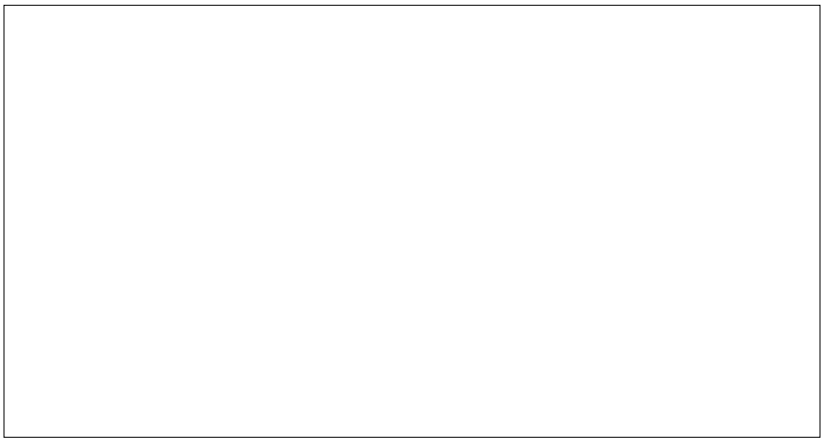
- Both can be challenging and complex
- However they are not a game!
  - Outcome is predictable and static
  - Outcome does not change



## What is a game?

- A game is an interaction where a player tries to achieve (meet) a goal/objective through a sequence of actions (plays/moves), which are chosen out of many possible choices

## What makes a game a good game?





## What makes a game a good game?

- "A great game is a series of interesting and meaningful choices made by a player in pursuit of a clear and compelling goal"

  Sid Meier – game designer

# Creating a game

- What is required to create a game?



# What is required?

- Idea
- Game objectives
  - What is the purpose of the game (game maker)
  - What is the objectives of the game (player)
- Story
  - Preamble
  - game story
- Tasks
  - What does one have to do to meet the objectives
- Graphics
  - Background
  - Costumes
- Animation
  - What type of animation (realistic, cartoon animation)?

# What is required?

- Music
  - Game branding
  - Company branding
  - What is the objectives of the game (player)
  - Directing the user (suspense, success, relax)
- Voice
  - Narrator - reading game story, filling the missing parts
  - Other non player participants (objects, live objects)
  - Background noises
- Sounds
  - Special effects



# Who participates in computer game?

| Part | Participants |
|---|---|
| Game objectives - | Producer, writer, scriptwriter |
| Story - | Writer, scriptwriter |
| Tasks - | Script writer |
| Graphics - | Artists, computer scientists |
| Animation – | Animator, computer scientist |
| Music - | Musician, sound engineer |
| Voice - | Actor, actress, |
| Sounds | sound engineer |

# Participants

- Each team member is required to fill a gap

**Team Member ≡ An Expert**



# Musician/Sound Engineer

- Expertise:
  - Create music
  - Mixing sounds
  - Special effects
- Audio design must follow game logic
- Audio must complement the game
- Sound logic drives
  - Music instruments
  - Style
  - Level

# Script Playwright

- Expertise:
  - Storytelling
  - Adjustments of existing stories
  - Games,
  - Dialogues
- Sets up
  - goals
  - Story background
  - Story flow



# Level Designer

- Expertise:
  - Games
  - Graphics design
  - creativity
- Divides story flow into phases
  - Adjust each phase to a level of difficulty
  - Determines how the level would flow
- Design
  - layout
  - Connectivity to other levels
  - Amount of details and duration at level

# Graphics Designer

- Expertise:
  - Gaming
  - Artist
  - Graphic Design
- Creates attractive images
  - Design visualization of level components
  - Design costumes
  - Colour combination
  - Creates a look and feel
- Maintain consistency throughout the game



# Animators

- Expertise:
  - Imagination
  - Choreography
  - Artist
  - Domain subject expert
  - Animation
- Design the moves
- Determine which models to use
- Design the control/connection moves
- Determines the type of animations
  - Video moves
  - Key frames

# Software Engineers/Programmers

- Expertise:
  - Computer science theory and applied
  - Computer graphics, AI, DB…
  - Programming languages, script lanuages
- Integrates the game bits and pieces together
  - AI
  - Game logic controls
  - Animation control & playback system
  - Game physics
- Design the graphics engine
- Performance tuning
- Ensure proper resource management



# Other Experts

- Voice artists/designers
- Game testers
- Marketing
- Sales
- Technical writers
- Music producers
- Network experts
- Physicist

# Participants

Creation
- Artists
- Software Engineers
- Musicians
- Writers/scriptwriters
- Sound engineer
- Animators

Administration
- Producers
- Directors
- Project managers
- Suppliers
- Distributors



# Phases of game design

- Conceptualization
- Script writing
- Development
- Distribution
- Feedback analysis
- Sequel / similar game

## Phases of game design (timeline)

- Conceptualization – 1 - month
- Script writing – 1-3 months
- Development – 6-10 months
- Distribution – 1-3 months
- Feedback analysis – 1-12 months
- Sequel / similar game – start over

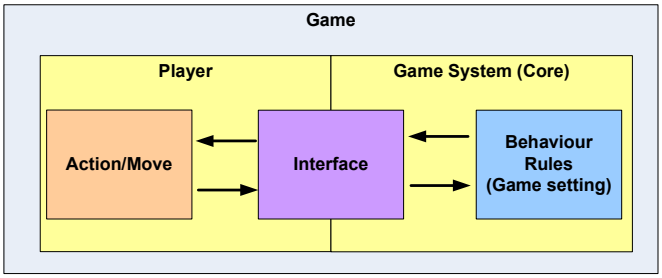


## Games and Computer Science

- Virtual reality
- Computer graphics
- Artificial intelligence
- Real-time
- Networking
- Graph theory
- Database
- Animation

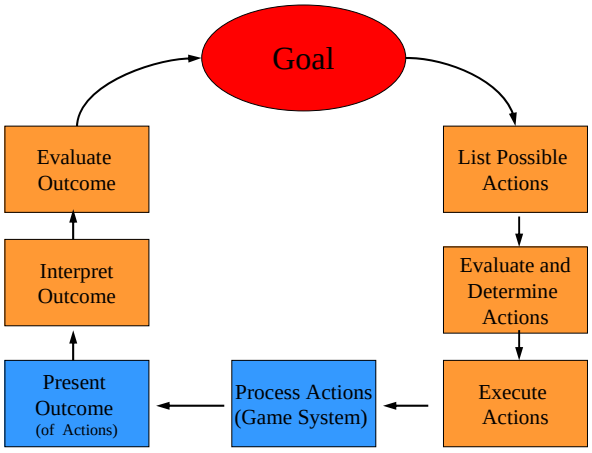
- Sound
- Input/output
- Resource management
- ...

# Player-Game Model

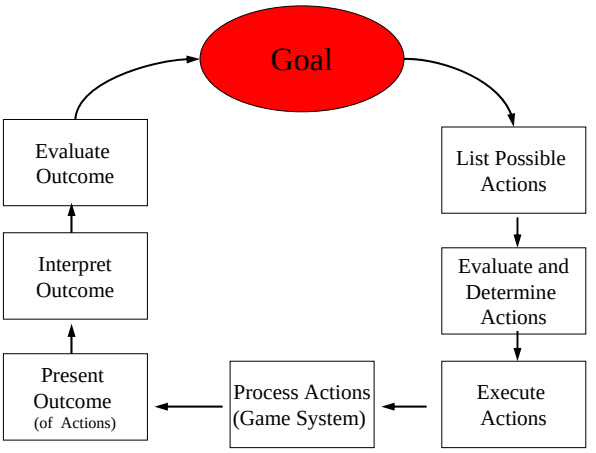





# Stages of Game Interaction



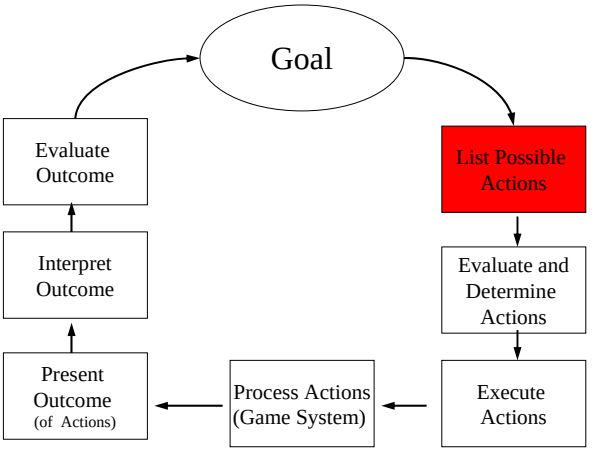
# Stages of Game Interaction




- Goal
  - Desired outcome
- Examples:
  - Enter the cave
  - Get a car

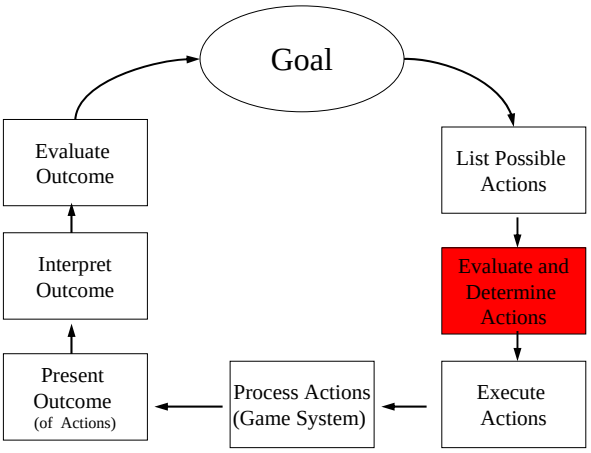


# Stages of Game Interaction




- List Actions
  - Create sequence of actions to achieve desired outcome
- Examples:
  - drive to cave
  - Climb the mountain
  - Fly and parachute

# Stages of Game Interaction



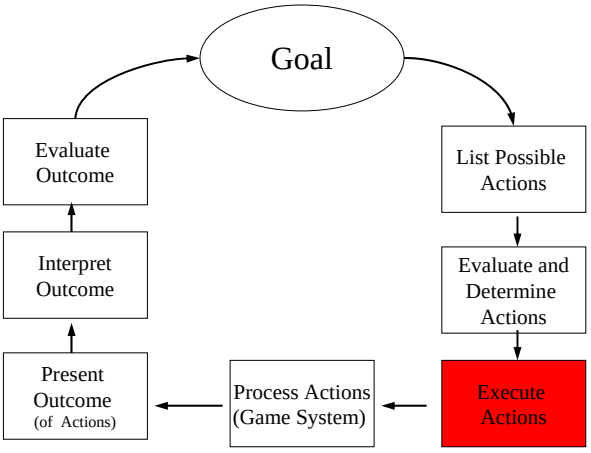

- Evaluate
  - Determine which action sequence is best
  - Determine order of smaller steps

Examples:

- Drive to cave
  - Lots of obstacles,
  - Slow road
  - Carry larger equipment
- Climb the mountain
  - Cheap
  - Slow
  - Small equipment
- Fly and parachute
  - Expensive
  - May miss the target
  - Small equipment

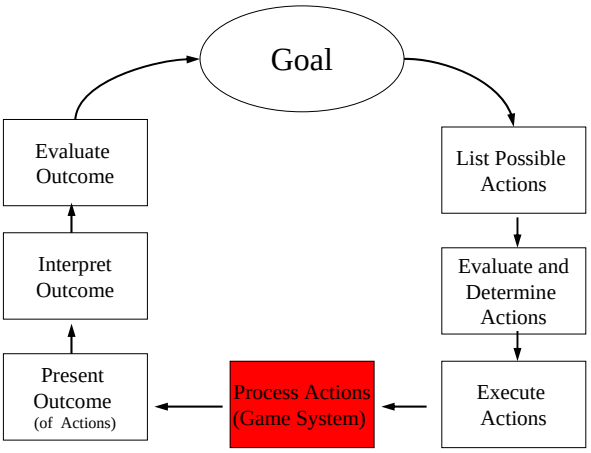


# Stages of Game Interaction




- Execute Actions
  - Start manipulating the game to perform desired actions
- Examples:
  - Organize equipment
  - Climb the mountain

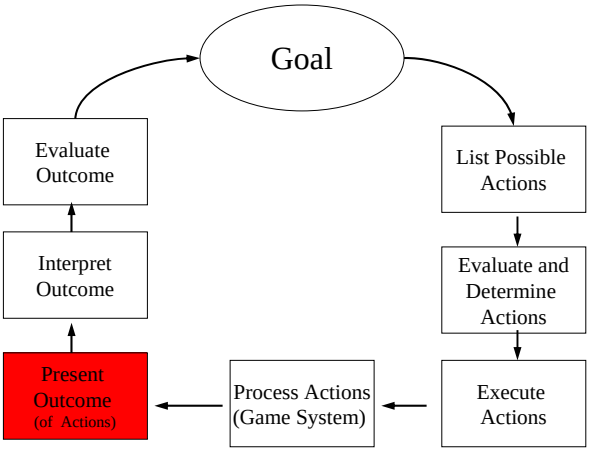
# Stages of Game Interaction




- Process Actions
  - Accept the user actions
  - Check game rules and state
  - Determine response to actions
- Examples:
  - Let user climb
  - Introduce a cliff (challenge)
  - Introduce some available equip.

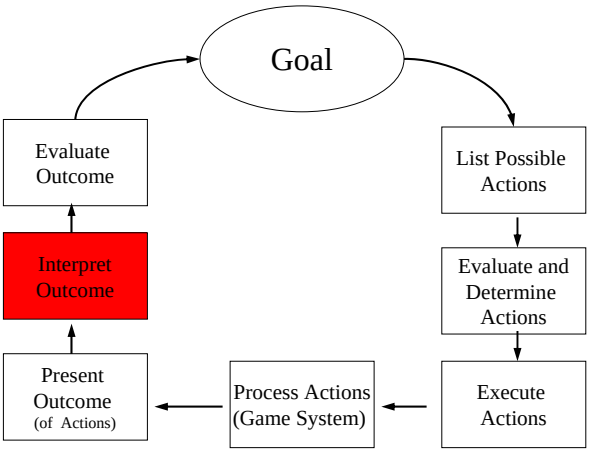


# Stages of Game Interaction




- Present Outcome
  - Show the progress
  - Show results of actions
  - Present challenge to user
  - Present game state
- Examples:
  - Present a 5 m. cliff
  - Present a bow and arrow
  - Present a tree on top of cliff
  - Present lumber at bottom of cliff

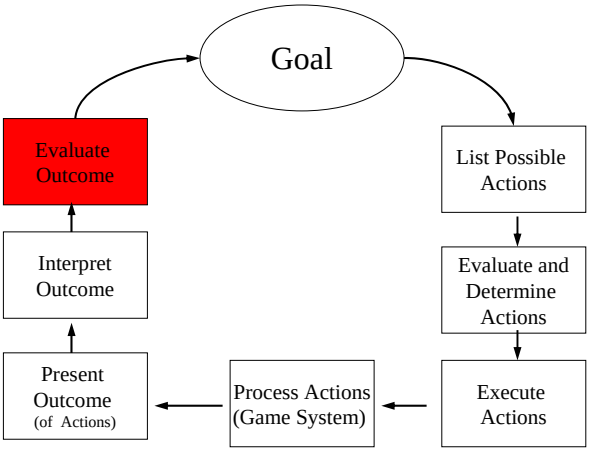
# Stages of Game Interaction




- Interpret Outcome
  - Understand the new game state
  - Examine the new state and its implication
  - Decide what are the options
- Examples:
  - Cannot reach cave
  - Overcome cliff
  - Causes delay

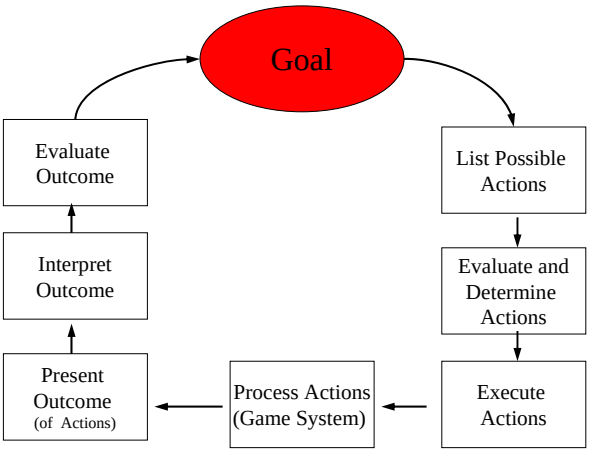


# Stages of Game Interaction




- Evaluate Outcome
  - Compare outcome against goal
  - What the implications are on the game
  - Evaluate few goals
- Examples:
  - What if I do not reach cave
  - How much time do I lose by not overcoming cliff
  - Is it worth it go over the cliff

# Stages of Game Interaction

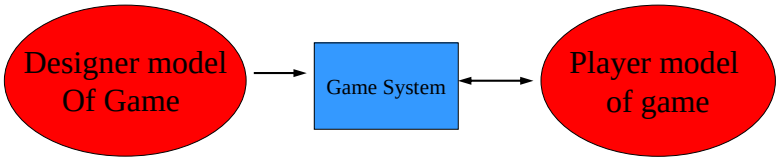



- Goal
  - Desired outcome
- Examples:
  - Climb the cliff

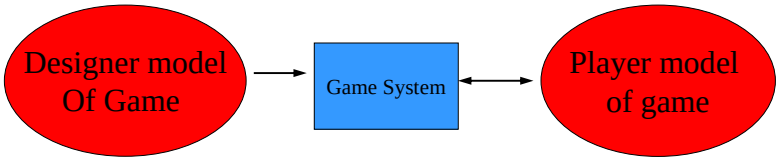


# Game Goals/Objectives

- Two people who do not interact –
  - Player
  - Game designer



# Car Racing Game




Drive as fast as possible to win the race

Finish the race without turning left



# Choices

# Choices

- Players have choices
  - Each choice create a new situation that must be addressed (big or small)
- Outcome
  - Outcome depends on the player's choice(s)
  - Not only the end result



# What makes a game a good game?

It is all about choices!!

- "A great game is a series of interesting and meaningful choices made by a player in pursuit of a clear and compelling goal"

  Sid Meier – game designer

# Choices and Consequences

Choices
- A question that is presented to the user
  - What vehicle do you want?
- A set of options that are presented to the user
  - A road junction
- Outcome
- Results of user's choice
  - A 4x4 vehicle consumes more gas (limiting range)
  - A left turn in the junction (a steep hill or longer road)



# Well designed choices

- Require a user to make a decision (think)
- Are related to user's objectives
- Motivate the user to make a decision
- Have some good and some bad effects
- Are different from other choices

# Types of Choices

- Obvious ⇒ no choice is to be made
- Uninformed ⇒ arbitrary decision
- Calculated (weighted) ⇒ good and bad results
- Real-time ⇒ little time to think
- Unrelated ⇒ choices do not affect the game
- Reversible ⇒ choices can be changed
- Irreversible ⇒ choices cannot be changed



# Impact of Choices

- Short term ⇒ only local impact
- Immediate ⇒ new decisions must be taken
- Long term ⇒ usually strategic effect
- No impact ⇒ choices are not related to game
- Reversible ⇒ user can learn from mistakes
- Irreversible ⇒ user must start over

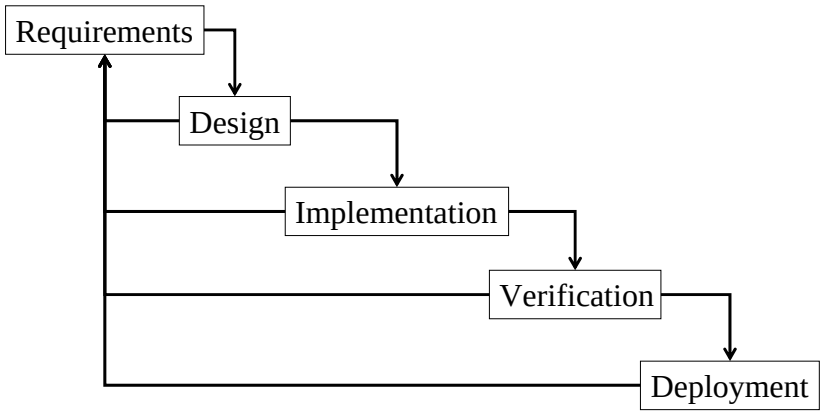
# SW Development



# Software Engineering

- Most team members are not CS
  - Graphics designers
  - Audio engineers
- Some have limited CS knowledge
  - Project managers
  - Marketing personnel
- Education phase must occur when working in a cross disciplinary environment

# SE Waterfall Model






# Waterfall Validation Model