

# MARIO SIDE QUEST

For LEGO® Super Mario™



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# INTRODUCTION



**Concept Development**



**Prototype Development**



**Demo**



**Playful Experience**



**Future Expansion**



**Conclusion**



**Questions**

# CONCEPT DEVELOPMENT - RESEARCH

## Lego Values:

<b>Belief</b>	Children are our role models			
<b>Mission</b>	Inspire and develop the builders of tomorrow			
<b>Vision</b>	A global force for Learning-through-Play			
<b>Idea</b>	System-in-Play			
<b>Values</b>	Imagination • Fun • Creativity • Caring • Learning • Quality			
<b>Promises</b>	<b>Play</b> <small>Promise</small> Play Well	<b>People</b> <small>Promise</small> Succeed and Grow Together	<b>Planet</b> <small>Promise</small> Positive Impact	<b>Partner</b> <small>Promise</small> Mutual Value Creation
<b>Spirit</b>	Only the best is good enough			



**Existing Game Play:**  
Super Mario LEGO  
experience



**Large Language  
Models**



**Personal Insight:**  
Working with Children

# CONCEPT DEVELOPMENT - RESEARCH

### Chosen Lego Set:

# LEGO® Super Mario™ Starter Course!



Entry Level  
Expandable  
Limited Interactions



- Accelerometer
- Bluetooth
- Speaker
- Colour Scanner
- Barcode Scanner



# CONCEPT DEVELOPMENT - RESEARCH

## Large Language Models – GTP 3

Remembers Past Conversation

Answers Questions

Data Analysis

Content Recommendation

Understands Language

Content Moderation

Text Based Games/Interactive

Storylines

Text Summarisation

Text Generation

Language Translation

Remembers Past  
Conversation

Data Analysis

Text Based  
Games/Interactive  
Storylines

Text Generation

# **CONCEPT DEVELOPMENT - RESEARCH**

## **Personal Insight**

**“I don’t know what game to play”**

**“I’ve already played that game”**

**“Tell me what to play”**

# CONCEPT DEVELOPMENT - RESEARCH

Personal Insight

## Imagination Prompt



# CONCEPT DEVELOPMENT - DESIGN

## Brainstorm Applying GTP 3

Generate Mini  
Games

Voice Narrating  
Play

Enable Mario to  
respond to  
speech

Imagination  
Prompts

Level Design  
Generator

Announce  
Data/Scores

Game Rule  
Generator

Remembers  
previous  
scores/games  
and compares in  
game

Meaningful  
Encouragement



# CONCEPT DEVELOPMENT - DESIGN

## Design Outcomes

Imagination  
Prompts

Use Single Player  
Starter Course

Data Analysis

Interactive  
Storylines

Use Accelerator and  
Interactive LEGO






Promote  
Fun

Mini  
Games



# CONCEPT DEVELOPMENT - DESIGN

## The Idea

-  Jump on  and Mario tells you a Side Quest
-  Bluetooth inside Mario sends his interactions during the Quest to the LEGO® Super Mario™ App.
-  The interaction data is analysed and used to generate a story of Mario's quest.
-  The story and scores can then be stored and celebrated on the App.

# PROTOTYPE DEVELOPMENT



**Tool Selection**



**Parameter Initialization**



**Quest Generation**



**Live Data**



**Story Generation**

# PROTOTYPE DEVELOPMENT

## Tools Used



**OpenAI GPT-3:**

**model\_engine = "text-davinci-003"**



**gTTS (Google Text-to-Speech)**



**Arduino Uno (To replicate live data input)**



**Python - Thonny**

# PROTOTYPE DEVELOPMENT

## Parameters

```
#Side Quest Interactive Brick
question_block = 1 #Triggers Mario Side Quest

#Barcode Actions - Mario's interaction with interactive bricks
jumped_on_bowserjr = 0
jump_on_goomba = 1
balance_on_bridge = 1
fly_on_cloud = 1
warp_pipe = 1 #Trigger to start level and timer
goal_pole = 0 #Trigger to end level and timer

# Mario Colour Scanner Data
blue_water_swimming = 0
red_lava_fall = 1
green_grass_run = 0

#Accelerometer Data from Mario that could be interpreted as:
fell_over = 0
flying = 0
front_flip = 0
back_flip = 0
cartwheel = 1

#Mario Coin Counter
coin_counter = 25
```

Placeholder variables for potential Mario interactions with interactive LEGO bricks

Potential variables created using Accelerometer data from LEGO Mario



# PROTOTYPE DEVELOPMENT

## Quest Generator



The initial Quest generator works by:



1 in 5 chance of a side quest activation



Selects random theme, nested action and time limit phrase

Create the initial prompt for GPT-3



Text to speech file is then made of the quest which is sent to Mario to say.

# PROTOTYPE DEVELOPMENT

## Quest Generator

```
theme_actions = {  
  "The sky has turned to pink custard!": {  
    "actions": [  
      "Jump on the Cloud and surf the custard collecting coins in the sky!",  
      "Make a tower as high as you can to reach above the custard and stay safe!",  
      "Annoy Goomba by jumping on him to stay afloat!"  
    ],  
    "time_limit": "As fast as you as you can!",  
  },  
}
```

Uses Mario Accelerometer,  
extends play arena, and uses  
Interactive LEGO Cloud

Encourages building  
creativity

Uses interactive  
LEGO Goomba

# PROTOTYPE DEVELOPMENT

## Quest Generator

```
"Bowser Jr has returned for revenge!": {  
  "actions": [  
    "Balance on the bridge to avoid Bowser Jr",  
    "Attack Bowser Jr and defeat him 3 times",  
    "Ambush Bowser Jr! Hide then push him in the lava!",  
    "Jump, cartwheel and flip to avoid Bowser Jr's attack!"  
  ],  
  "time_limit": "Untill Bowser Jr surrenders and runs away",  
},
```

Use of interactive  
LEGo

Story based  
encouragement

Uses Mario  
Accelerometer to  
create story

# PROTOTYPE DEVELOPMENT

## Quest Example




The sky has turned to pink custard!  
Jump onto the clouds and surf the  
custard! Collect coins as quickly as you  
can. Try to dodge Goomba and stay  
ahead of the clock. Have fun!

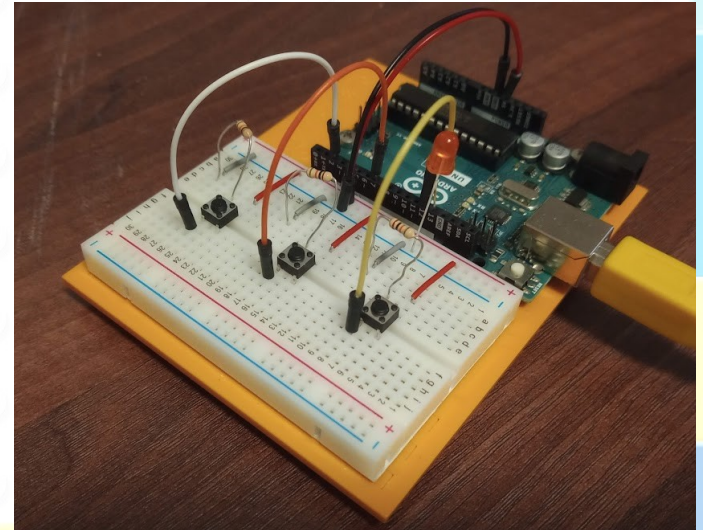




# PROTOTYPE DEVELOPMENT

## Quest Activation

-  Warp pipe Quest activation – Time Starts
-  The program then listens to receive interaction data from Mario during the Quest via Bluetooth
-  For this Prototype an Arduino is replicating live data input





# PROTOTYPE DEVELOPMENT

## Live Data

Program receives push button data from the Arduino Uno to represent:



**Mario jumping on Bowser Jr**



**Mario falling over**



**Mario jumping on the flagpole – ending the Quest**

```
App: 3..2..1 COMPLETE YOUR QUEST MARIO!!  
Mario: fell_over: 1  
Mario: fell_over: 2  
Mario: jumped_on_bowserjr: 1  
Mario: fell_over: 3  
Mario: jumped on the goal_pole: 1  
App: Mario scores received!
```

# PROTOTYPE DEVELOPMENT

## Story Generation

GTP – 3 then takes:



**Original Quest statement and the live data  
(and placeholder data)**



**Generate a story of Mario's Adventure**

```
# Conditionally include jump_on_goomba
if jump_on_goomba >= 1:
    prompt += f"\n- Annoy Goomba by jumping on him and defeating him ({jump_on_goomba} times)'"

# Conditionally include fly_on_cloud
if fly_on_cloud >= 1:
    prompt += f"\n- Jumps on a cloud and surfs through the sky {fly_on_cloud}"
```

# PROTOTYPE DEVELOPMENT

## Story Example

Mario jumped down the wall pipe and was determined to defeat Bowser Jr. He started by jumping on Goomba to annoy him, eventually defeating him. Along the way he stumbled and fell 3 times before hopping on a cloud soaring through the sky. He then struggled to balance on a bridge, narrowly avoiding falling off. With one final jump, he landed on Bowser Jr and defeated the tyrant. Mario wasn't out of the woods yet, as he fell into the burning lava. With one last effort Mario jumped on the goal pole and earned the 25 coins he had been striving for.



# PROTOTYPE DEVELOPMENT

## Live Demo





# PLAYFUL EXPERIENCE

Side Quest's prompt new avenues of imaginative gameplay by:



Using LEGO play to creatively control a story outcome.



Expanding the Mario World by creating unique and amusing narratives that can be expanded on in future play.



Create a Quest collection and comparison interest in children as every quest Story will be different.



Using accelerometer data to identify when Mario falls over or backflips adds a humours element to story crafting.



Provide the little imagination prompt a child might need when deciding what to play next



# **FUTURE EXPANSION**



**Experiment with live Mario data and track the order of interactions, to generating more personalised stories.**



**Expand Story Generation to multi-player and add interactions from other Super Mario LEGO sets.**



**Engineer the story prompts to be more playful, humours and accurate to gameplay.**



**Experiment with Accelerometer data to define Mario's movements**



**Use the LEGO® Super Mario™ App to store the Quest Stories as collectable items, where children can share and compare their quests with friends – And collect them all!**

# CONCLUSION



**Enhances Super Mario experience using a large language model and text to speech**



**Respected Lego Values**



**Prompts Imaginative Play**



**Expands on the possibilities of LEGO play beyond classic Mario gameplay**

**ANY**  **'S ?**