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:

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

Existing Game Play:
LEGO Super Mario

Large Language Models

Personal Insight:
Children's Playworker

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 – OpenAi GTP 3.5

Remembers Past Conversation

Remembers Past Conversation
Answers Questions
Data Analysis

Data Analysis

Content Recommendation
Understands Language
Content Moderation
Text Based Games/Interactive Storylines

Text Based Games/Interactive Storylines

Text Summarisation
Contextually Relevant
Language Translation

Contextually Relevant

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 3.5

Imagination Prompts

Enable Mario to respond to speech

Generate Mini Games

Voice Narrating Play

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 Accelerometer and Interactive LEGO

Mini Games

Promote Fun

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-3.5:**

   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 Mario's 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-3.5

- Text to speech file of quest which is sent to Mario to announce.

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

Use of interactive LEGo

Story based encouragement

Uses Mario Accelerometer to create story

```
"Bowser Jr has returned for revenge!": {
    "actions": [
        "Balance on the brigdge 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",
},
```

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
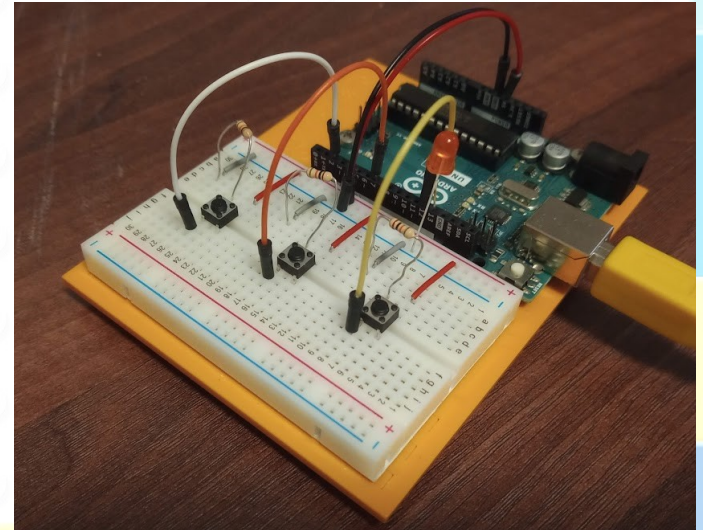
Quest Activation

🟨 **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 3.5 then takes:

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

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

```python
# 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 warp pipe and was determined to defeat Bowzer 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 and 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

🟨 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.

🟨 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

Mario Side Quest

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

- Respected LEGO Values

- Prompts Imaginative Play

- Expands creativity beyond classic Mario gameplay

- Sharing Quest experiences contributes to the LEGO app community

ANY ❓❓'S ?