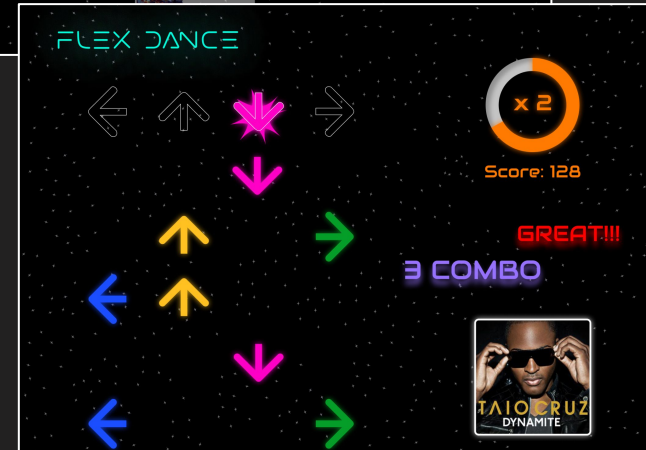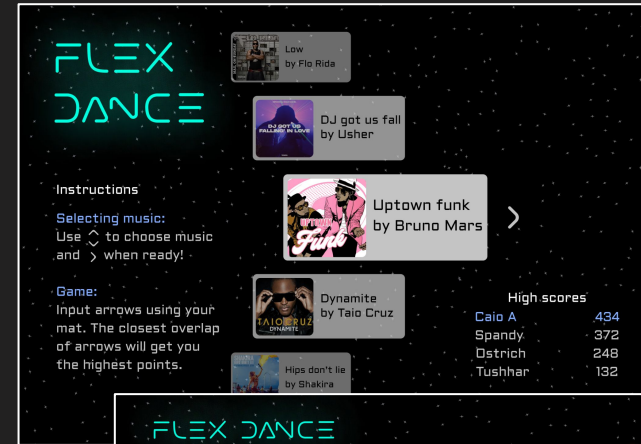# Team A3 - Flex Dance

Spandan Sharma, Caio Araujo, Tushhar Saha

Contents:
- Use Case / Application and Primary (Quantitative) Requirements
- Solution Approach
- System Implementation
- Testing, Verification and Validation
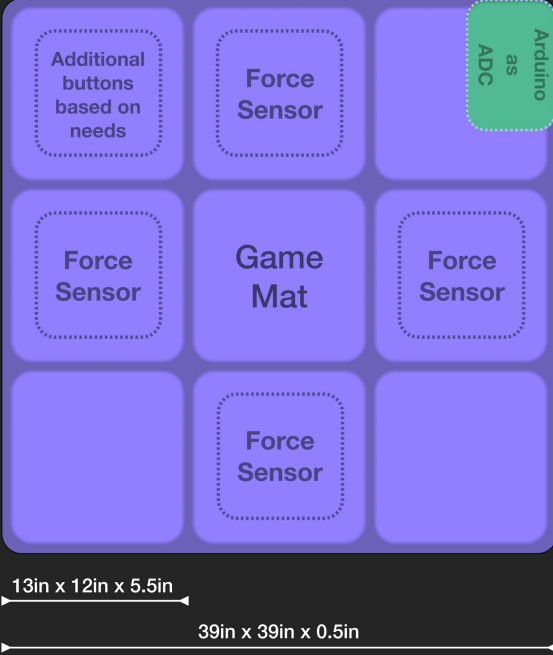- Project Management
- Lessons Learned

Use Case Requirements

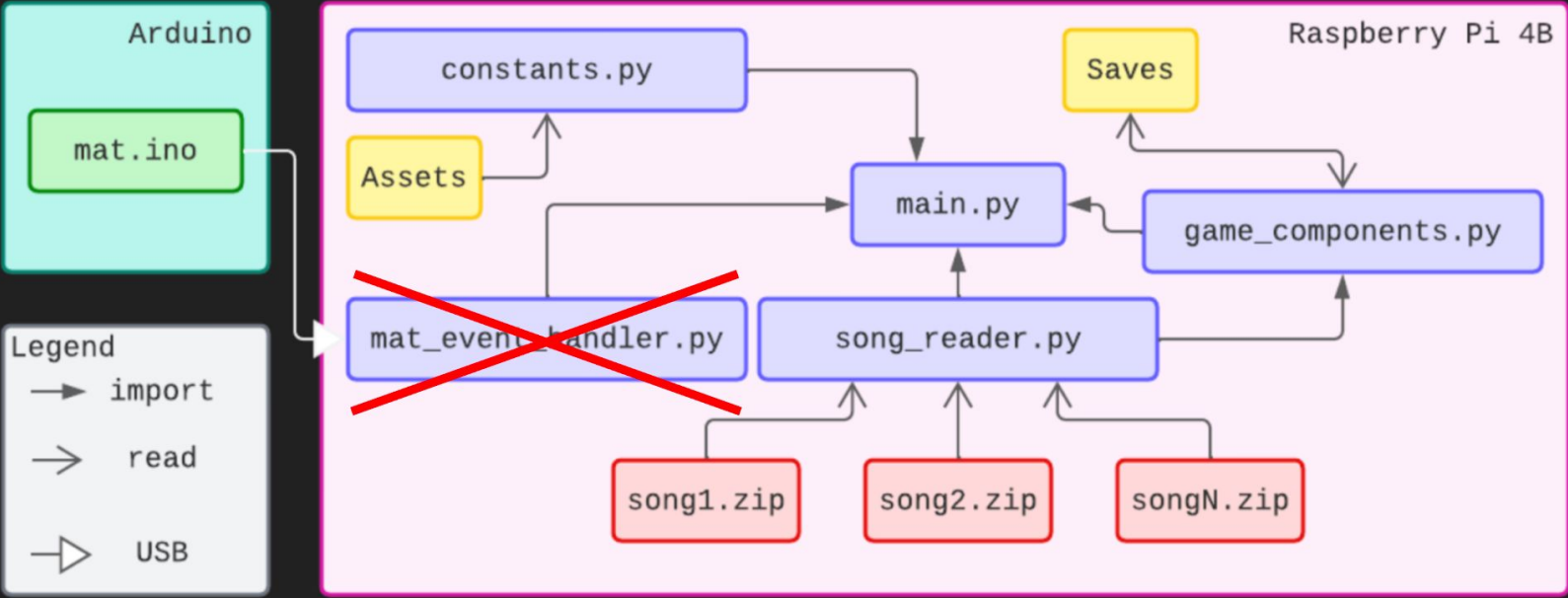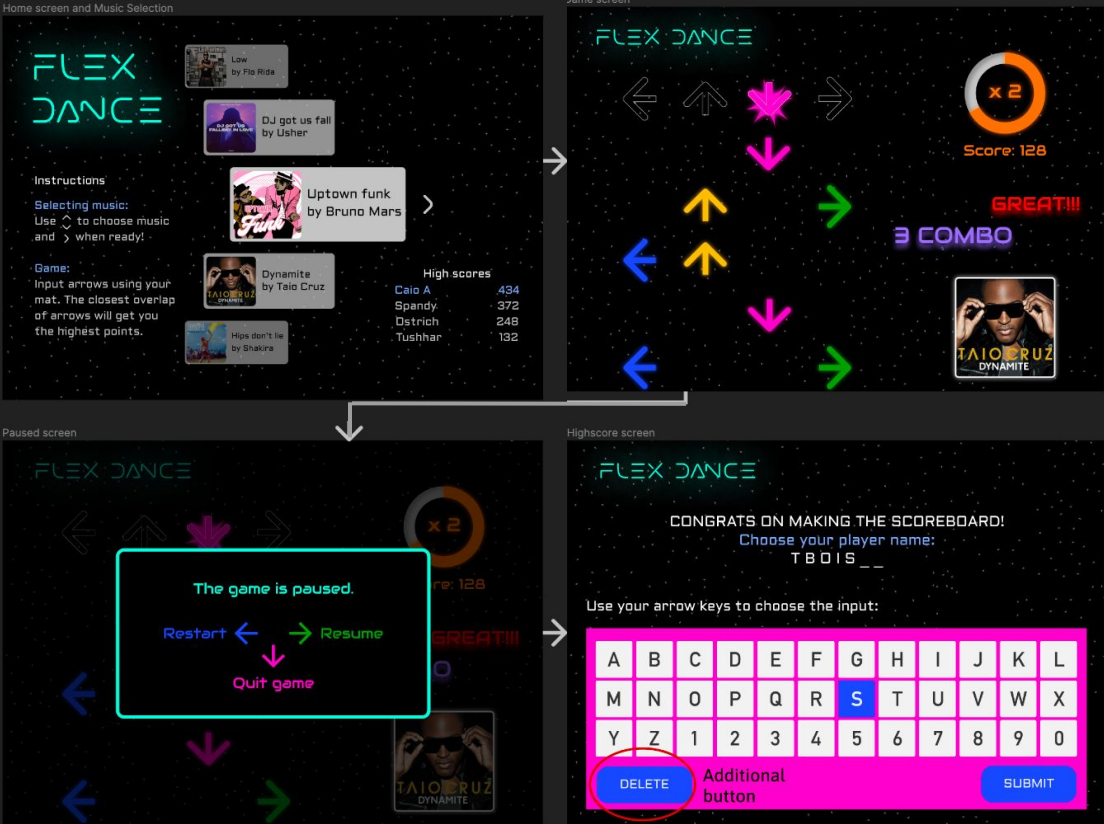| Requirement	Why?
Easily run game: Game screen is 3 clicks away	Beginner-friendly interface
Storage size: Folded size < 13 x 12 x 5.5 in^3 Unfolded size < 39 x 39 in^2	Easy to store: Size of average drawer; Living room space
Stimulating while respecting visual weight: follow 60-30-10 rule	Keeping users engaged without overwhelming them
Lasts ~ 650 sessions	Assuming user exercises 4 days/week and plays game for 3 years

Use Case Requirements

Requirement	Why?
Error rate < 1%	Calculation shown in Design Review
Arrow button 360° coverage	User can press the buttons in any feet orientation
Latency of signal between Arduino to Raspberry Pi < 100ms	Humans perceive images in 1/10th of a second
Force detection threshold ~10 lbs	Resting foot weight

Additional buttons based on needs | Force Sensor | Arduino as ADC

Force Sensor | Game Mat | Force Sensor

Force Sensor

13in x 12in x 5.5in

39in x 39in x 0.5in
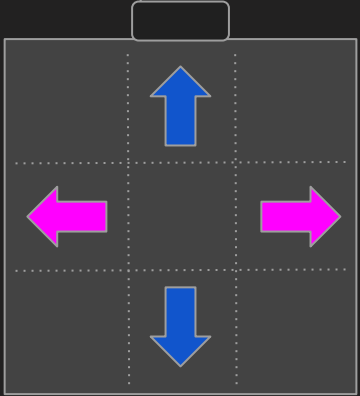
Solution Approach
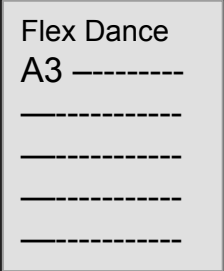
Solution Approach: <u>Game interface</u>

Complete Solution

FLEX DANCE
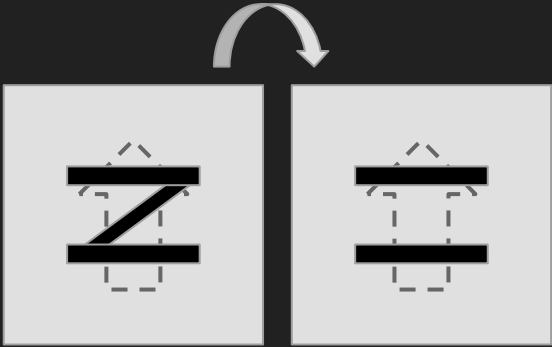
Display 15-30s clip of instructions and game in action

Interested people can come up and play

Poster for our project

Flex Dance
A3 ----------
_____
_____
_____
_____
_____

Testing Force Sensitive Resistors (FSRs)

- Z shape -> 2 Parallel FSRs

- Other considered options:
  - 1 FSR per plate
  - "X" shape
  - "+" shape

- Resting foot
  - Tested with 4 people
  - None triggered the plate

- Coverage (different orientations of foot)
  - Test data in table

Testing, Verification, and Validation

Direction of foot	Successful hits (out of 10)
North	10
North East	10
North West	9
East	2
West	7

Testing Latency

- Very successful!

- iPhone slow mo + video editing Software

- 1 frame delay at 30 FPS, 4x slow

Response time = 1 / (30 * 4)

= 8 ms
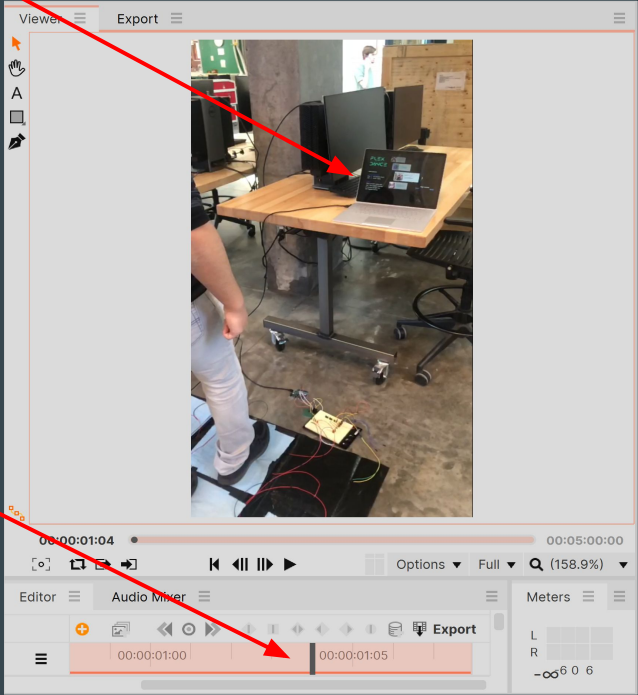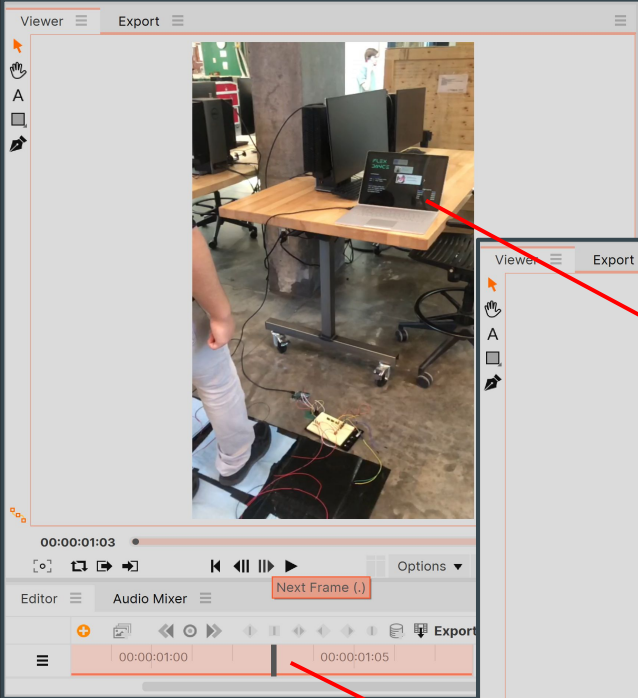
Testing, Verification, and Validation - Summary

Requirement	How to measure	Original Goal	Actual Measurement
Folded size	Measuring tape	<= 13 in x 12 in x 5.5 in	14 in x 14 in x 5.4 in
Unfolded size	Measuring tape	<= 39 in x 39 in	40 in x 40 in
Minimum force detected	Arduino serial monitor and force gauge	~ 10 lbs	10.2 lbs
Arrow button coverage	Step on the mat in different orientations	360° coverage	~270°

Testing, Verification, and Validation - Summary (cont'd)

Requirement	How to measure	Original Goal	Actual Measurement
Latency	Measure time b/w sending and receiving signal using python	<= 0.1 s	0.008 s
Error rate	Step on the mat to register successful detections	<= 1%	4%
Fair scoring scale	Have few people play the game and state if they get frustrated	<= 25% people frustrated	Not verified yet
Cost	Components' cost	<= $180	Over $180

Project Management

Our endgame plan looks like this:

	M	T	W	Th	F	S	Sn	M	T	W	Th	F
	Apr 25	Apr 26	Apr 27	Apr 28	Apr 29	Apr 30	May 1	May 2	May 3	May 4	May 5	May 6
Caio	Resize arrow dimensions	Add animations when arrows are clicked	Usability testing						Get game to work with demo monitor			
Tushhar			crimp wires + usability testing		Laser cut box for arduino							
Spandan			Usability testing			Paint arrows and arduino storage box	Add sounds when arrows are scored		Complete final video			
Tushhar & Spandan	*Final presentation*		*Peer reviews*			Compile content and finish final poster				*Final Video deadline*		*Final Report deadline - May 7*
All							*Final Poster deadline*				Compile content and finish final report	Compile content and finish final report

Lessons learned

Communication is key

Explicitly decide what the deadlines and expectations mean for each member

Be user-centered

Be mindful of your target audience and how your projects tradeoffs directly impact them

Leave buffer

Things will go wrong so have room allocated for unexpected obstacles