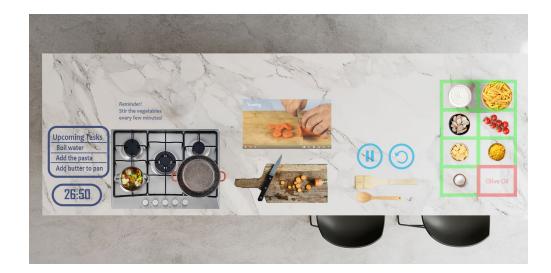
Team E8 - TableCast Design Review

Caroline Crooks, Tahaseen Shaik, Sumayya Syeda

Use Case & Requirements

- Guides users through recipes using extensive CV, projection and voice commands
- Limited interaction with web-app/device
- Gesture & voice recognition for user interaction
- Adaptive Projections
- 85% User Satisfaction



Design Requirements

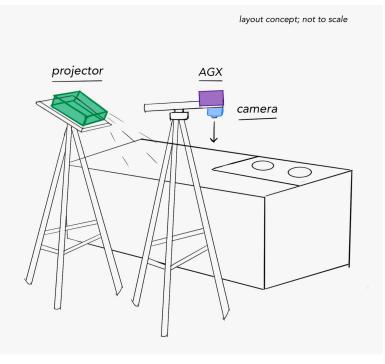
- IR1. Projector mount must be adjustable
- IR2. Warped projection on table looks flattened
- IR3. Voice commands must recognize wake word to complete any command
 - IR2a. Accuracy of 90%
- IR4. Camera must be mounted such that it points down and is 3-5 feet above the counter
- IR5. Gesture recognition must have 99% accuracy

Solution Approach

- Major Design Changes
 - Camera & AGX Mount on a tripod, centered above counter
 - Projector Mount on a tripod, at an angle
- Societal Effects
 - Economic: Lower cost alternative that can be efficiently packed
 - Public/Health/Welfare
 - User-friendly interface that encourages beginners to cook and lead healthier lifestyles
 - Designing secure mounting mechanisms to ensure user safety
 - Social/Cultural: Increased accessibility to recipes across cultures

3D Diagram

- Projector stand tripod
- Tripod with horizontal arm overhead camera positioning
- 3D printed case to protect camera component



Projection UI

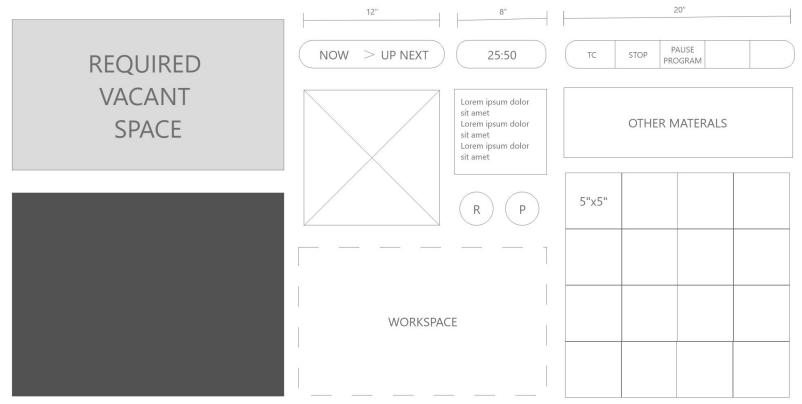
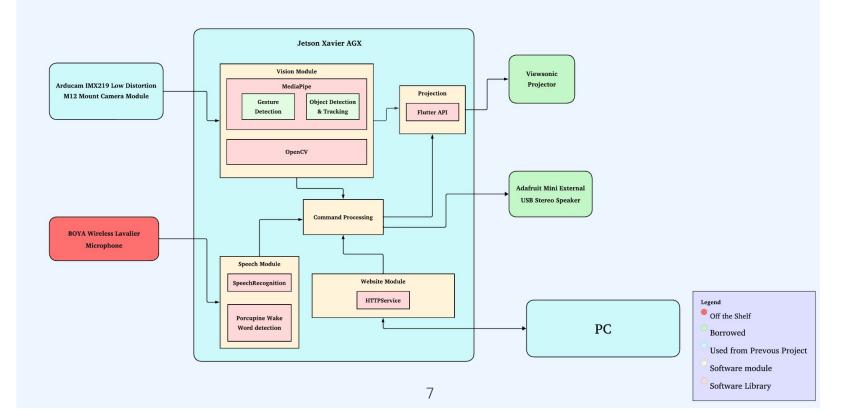


Table UI (Left Aligned Burner)

Components Block Diagram



Trade Studies

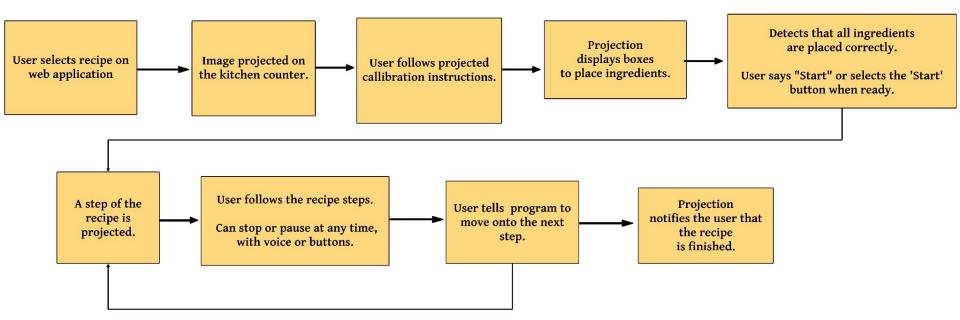
Gesture Recognition

Projector

	MediaPipe	OpenPose
Computing Power	5	3
Latency	5	3.5
Precision	4	5
Total	14	11.5

	ViewSonic	VANYKO	
ANSI Lumens	5	3	
Projection Size	3 4		
Projector Size	4 2		
Cost	4	4	
Total	16 13		

Solution Flow

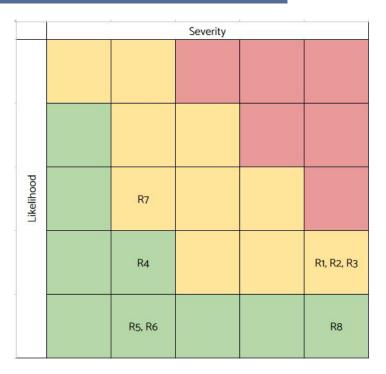


- Testing & Verification -

- IR1. Test stability with projector weight at 5 different recommended heights
- IR2. Test wake word at 5 different decibel levels with varying disturbances to imitate kitchen environment
 - IR2a. Ensure accuracy of 90%
- IR3. Check camera stability at heights between 3-5 feet and clarity of counter image
- IR4. Verify gesture recognition has 99% accuracy with 5 different backgrounds
- IR5. Match warped projection on table to actual image and test straight lines and geometric shapes

Risk Factors

- R1. Camera falls (redundant mounting security)
- R2. Projector falls (redundant mounting security)
- R3. Camera is damaged by food (covered with plastic wrap)
- R4. Gesture is ignored (increase sensitivity)
- R5. Gesture is recognized incorrectly (increase testing)
- R6. Wake up word ignored (increase sensitivity)
- R7. Voice command recognized incorrectly (increase testing)
- R8. Server crashes (Safe system shutdown)



Schedule

	FEB	MAR	APR
Sprints			
✓ 🖸 TAB-1 Hardware			
TAB-5 Projector Assembly TO DO SUMAYYA	Ø		
TAB-21 Camera Testing TO DO SUMAYYA	Ø		
TAB-22 Microphone Testing TO DO CAROLINE	e		
TAB-23 Hardware Integration TO DO SUMAYYA	L.	Ø	
✓ S TAB-2 Software			
TAB-6 Vocal Recognition Li TO DO CAROLINE		Ø	
TAB-25 Voice Command Te TO DO CAROLINE			Ø
TAB-26 Projector/Web App TO DO TAHASEEN			
TAB-7 Web Interface TO DO TAHASEEN			
TAB-8 User Interfacing 🕹 TO DO CAROLINE		Ø	
TAB-24 Projector Interactio TO DO CAROLINE			
TAB-27 UI Cleanup TO DO CAROLINE			Ø
✓ ✓ TAB-3 Computer Vision			
TAB-9 OpenPose Gesture TO DO SUMAYYA	Ø		
TAB-28 Initial Gesture Trac TO DO SUMAYYA	4	0	
TAB-29 Gesture Tracking A то DO SUMAYYA		Ø	
TAB-10 Projector Calibration TO DO TAHASEEN	1	8	
TAB-30 Projector Calibrati TO DO TAHASEEN		Ø	
TAB-34 Projector Calibrati TO DO TAHASEEN			Ø
TAB-11 Object Detection R TO DO TAHASEEN	0		
TAB-32 Initial Object Detec TO DO TAHASEEN	~ @ <		
TAB-31 Object Detection A To DO TAHASEEN		Ø	
TAB-12 Object Tracking To DO SUMAYYA			
TAB-33 Object Tracking Te TO DO SUMAYYA		67	
TAB-4 Project Management			
TAB-13 Trade Studies & DONE			
TAB-17 Parts Procur IN PROGRESS TAHASEEN			
TAB-18 Project Proposal DONE TAHASEEN			
TAB-20 Logo Creation DONE CAROLINE			R
TAB-35 User Testing TO DO CAROLINE			

12