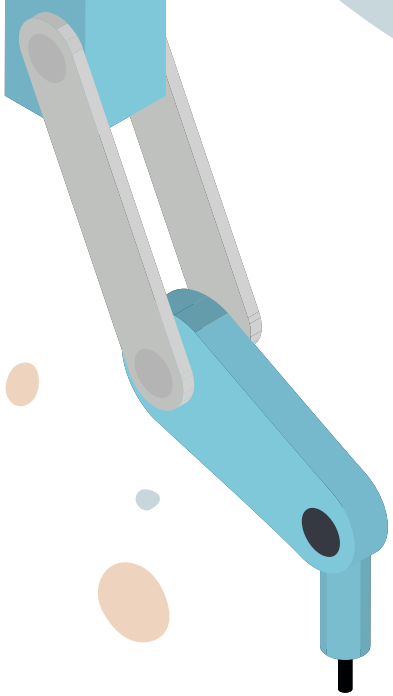

Home Kitchen Robot

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Reia Menezes M00791121

Table of Contents

Introduction

- The increasing demand for automation in everyday environments has led to the growing use of collaborative robots in tasks that were once considered entirely human. These robots are currently being developed to help with repetitive, precise, or time-consuming tasks in both households and manufacturing environments.

- Particularly, kitchens can offer a perfect environment for the use of robotic systems that can help with day to day cooking. The incorporation of robotics into everyday cooking tasks has the potential to completely alter how families prepare meals while maintaining the standard and appeal of home-cooked meals.

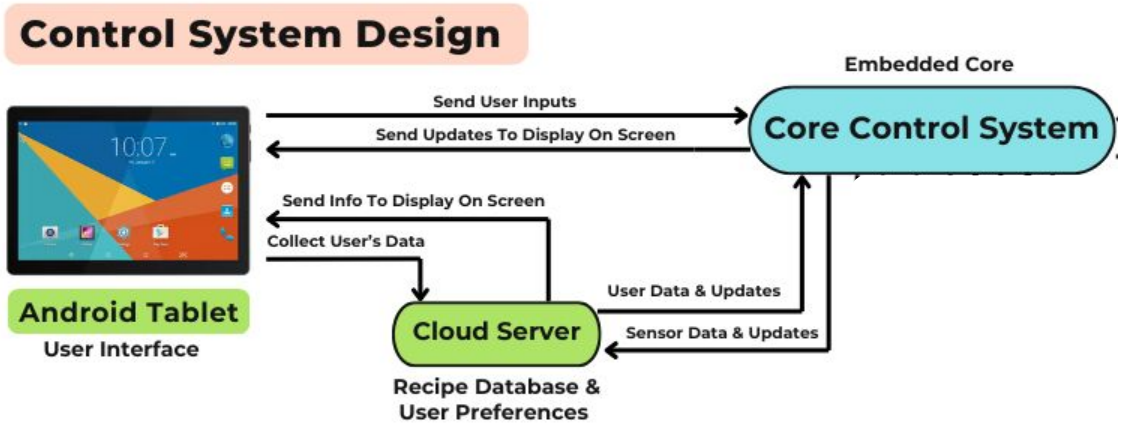
- By reclaiming time, enhancing access for a wide range of users, and providing reliable, high-quality meals that meet dietary requirements and personal preferences, we hope to show not only the technical feasibility of kitchen automation but also its potential for transforming everyday cooking activities.

Problem Statement

- The need for automated kitchen solutions has increased significantly in today's fast-paced culture as a result of multiple causes.

- As the elderly population seeks independence in everyday tasks, upcoming generation lacking in basic cooking skills, time constraints seen among working professionals, and the growing interest in smart home technologies have all combined to provide an ideal environment for innovation in kitchen automation.

Control System Design



01 Core Control System

Device Driver Layer - Communicate With Hardware
Middleware Layer - Communicate With Hardware & Software
Functional Module Layer - Processing & Decision Making

02 User's Preferences

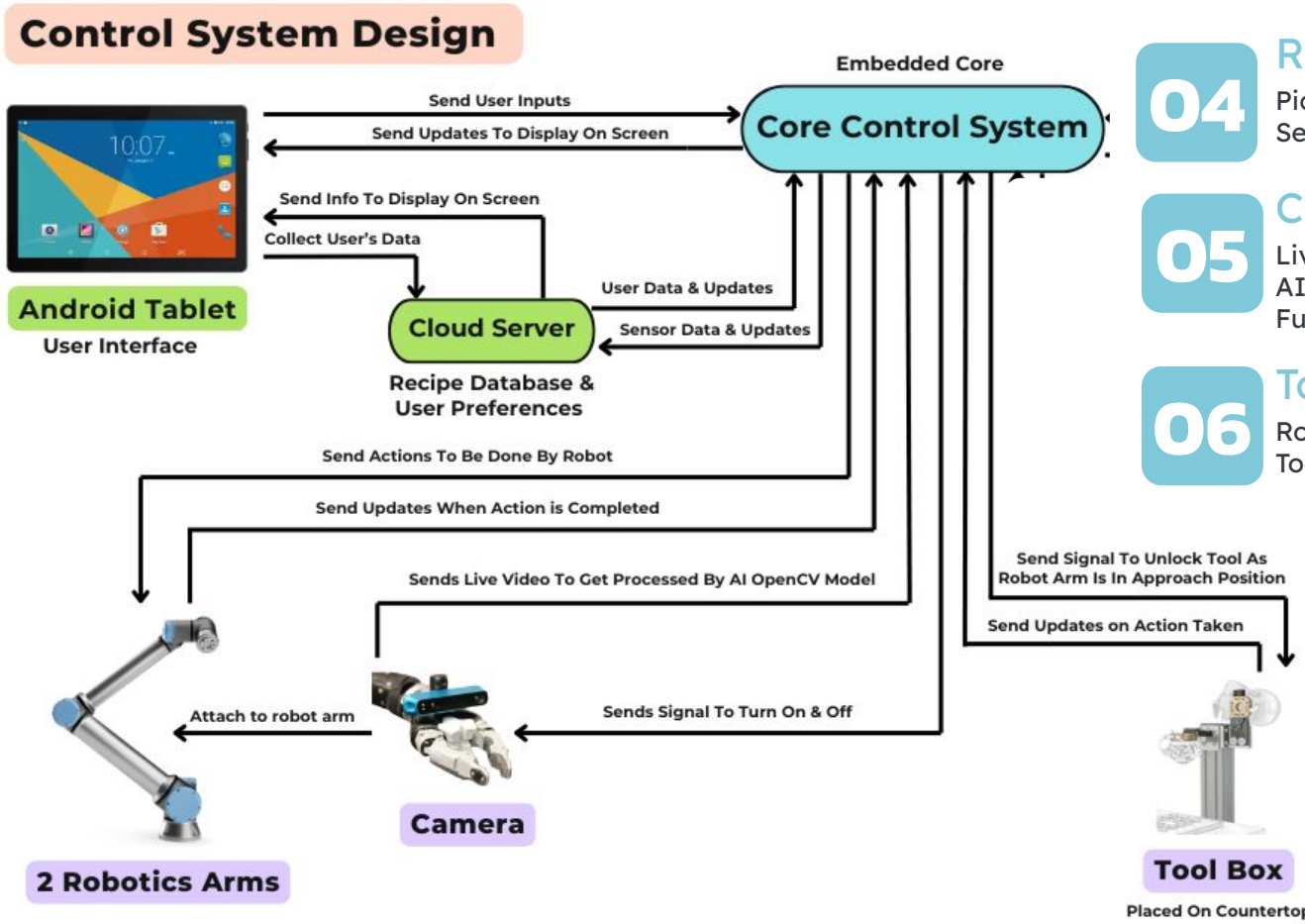
Stored on AWS Cloud Storage
AES-256 Encryption - Secret Key Unique To Authorized User

03 User's Inputs

HTTPS - Larger Data Transfer Upon Request
MQTT - Smaller Data Transfer Sent Continuously

(Shao et al., 2020) (Kewate, 2022) (Manthiramoorthy et al., 2024) (Hong, Kang and Kwon, 2023)

Control System Design



04 Robotics Arms

Pick & Place Ingredients Based On Sequence
Set Tool For Cooking Actions

05 Camera

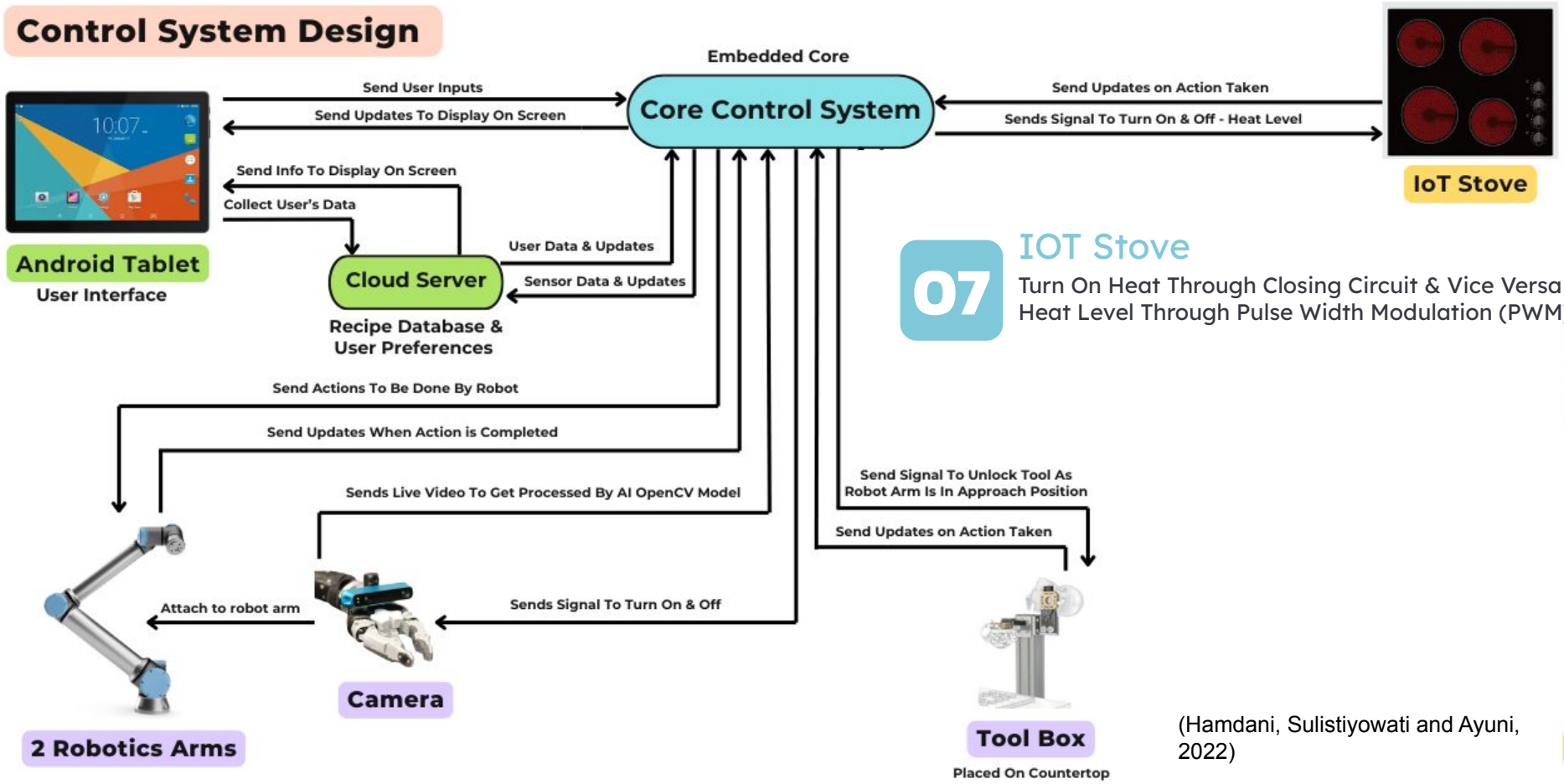
Live Video Feed Shared With Core System
AI Model & Processing On Core System - Functional Layer

06 Tool Box + Changer

Robot Coupling on End Effector
Tool Box Positioned To Ensure Alignment

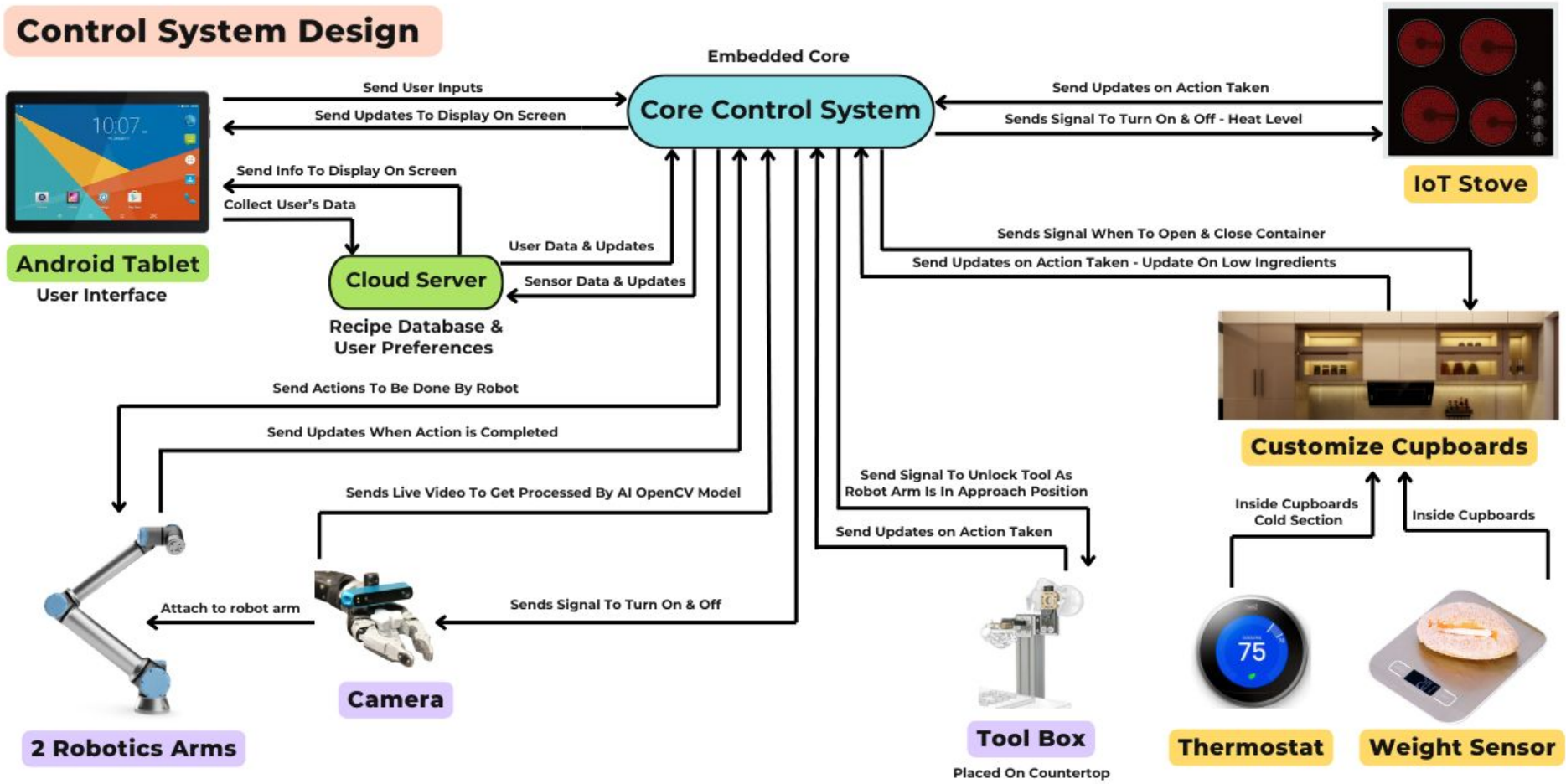
(Leitão, 2019) (Universal Robots, 2025)
(Bellinger and Lamarche-Cliche, 2023)

Control System Design



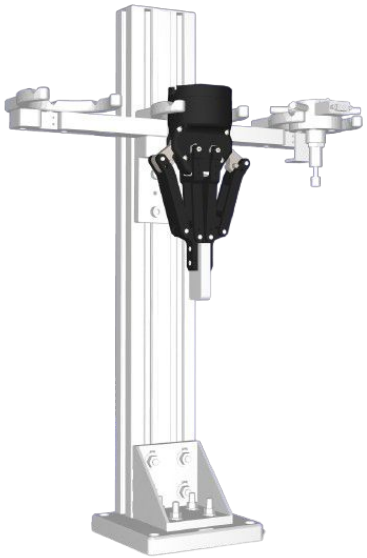
(Hamdani, Sulistiyowati and Ayuni, 2022)

Control System Design

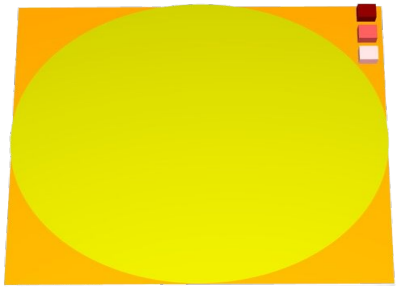


Components Used: Hardware - Simulation

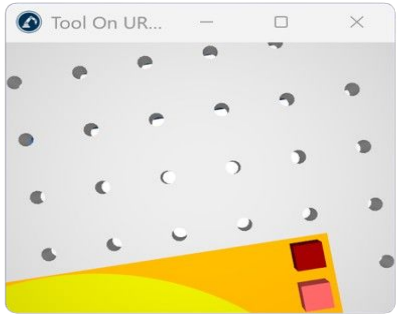
UR10e Robot



Toolkit

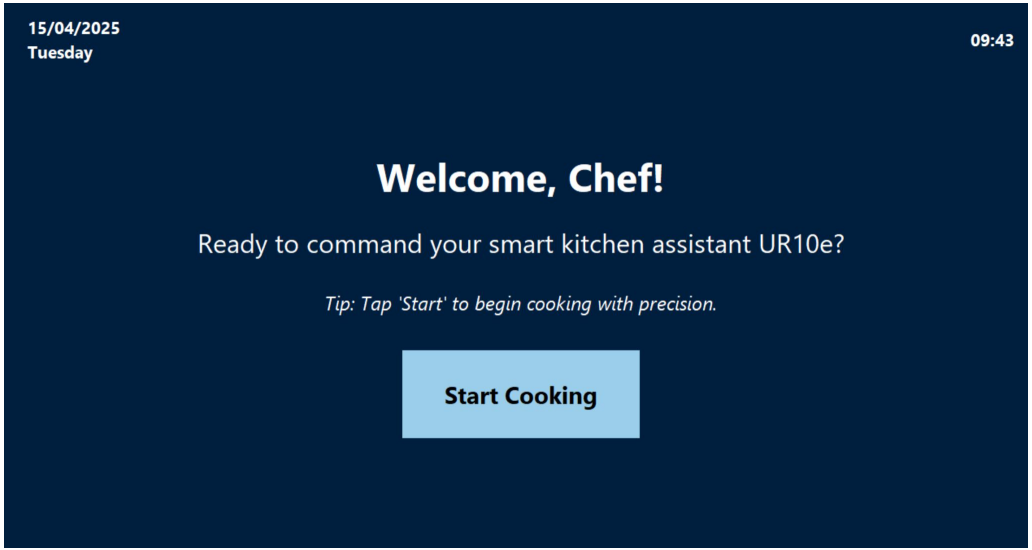


Electric Stove



Virtual Camera

Components Used: Software - Simulation



OpenCV

RoboDK
ROBOT DEVELOPMENT KIT

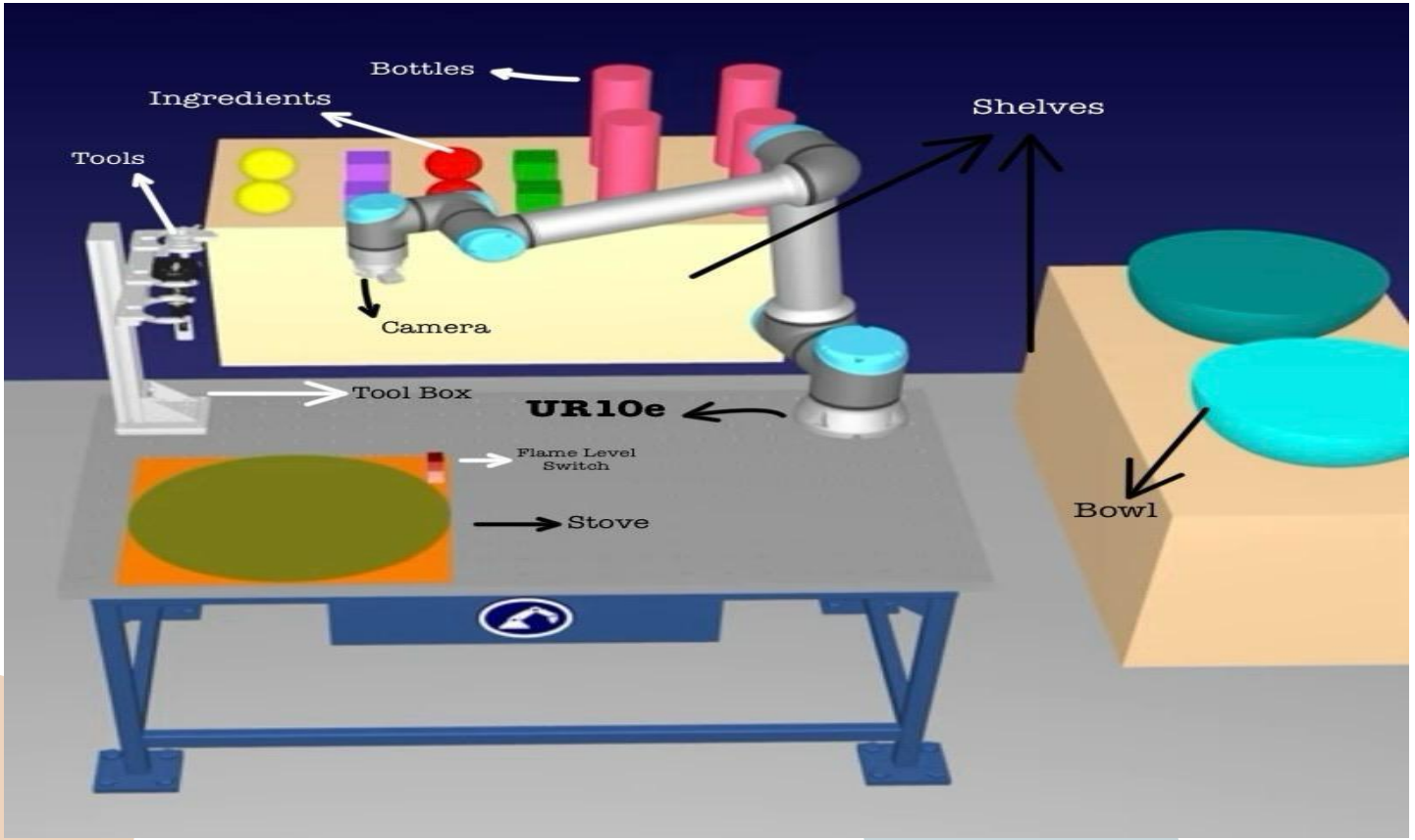
Tkinter

Simulation Setup

- The required software programs were thoughtfully selected, set up, and configured in order to execute a working simulation of the robotic cooking process.

- For a realistic depiction of the home kitchen cooking robot process, the preparation required setting up the virtual environment, installing the necessary tools, and defining key object placements.

Simulation Setup on Robodk



Challenges Faced

- The restricted features of the RoboDK free version license was one of the main obstacles faced during the project development.
- The inability to add two robots to the simulation was one of the advanced features that were limited since a full license was not available. This restriction had an effect on the original concept of placing 2 robots which would have increased productivity and efficiency .
- As an alternative to the problem, the simulation was designed using a single robotic arm, ensuring all necessary operations could still be executed within the constraints of the free version.

Implementation and Demonstration

GitHub Link:

https://github.com/reiamenezes2004/pde4435_coursework2_ris.git

YouTube Link:

https://youtu.be/Z9bfok9eZ-o

Conclusion

1

Control System Design

Overview of System &
Integrations
Details About Components

2

Simulation Setup

Creating Simulation &
Setting It Up
Challenges Faced

3

Demonstration

Showcasing RoboDk
Simulation

Future Development

1

Cleaning Dishes

Pick & Place Utensils in Dishwasher
Remove Once Cleaning Completed

2

Cleaning Tools

Special Compartment For Holding
& Cleaning Tools
Placing Back On Tool Box

Contribution Table

PDE4435 - Coursework 2 - Contribution Sheet				
	Type of Work Done	*Contribution By*		
Sr. No.	**Name**	**Akansha**	**Salma**	**Reia**
1	RoboDK SImulation			
2	Python GUI			
3	Report (IEEE format)			
4	Powerpoint			
5	Logbook			
6	Video Demonstration			
7	GitHub			

Key
Worked On
Did not work on
Helped

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Thank you!