Track My Shop - A shops, products and services tracking system near specified location

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BS(HONS)
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DEPARTMENT OF COMPUTER SCIENCE

GC UNIVERSITY LAHORE

Track My Shop

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Declaration

I, Muhammad Zeeshan Yousaf and Fatima Yousaf students of **BS(Hons)** in the subject of **Computer Science** session **2019-2023**, hereby declare that the matter printed in this thesis titled, **Track My Shop** is my own work and has not been printed, published and submitted as research work, thesis or publication in any form in any University, Research Institution etc in Pakistan or abroad.

Date: ________________ **Signatures of Deponent**

Research Completion Certificate

It is certified that the research work contained in this thesis titled **Track My Shop** has been carried out by **Muhammad Zeeshan Yousaf** Roll. No **0259-BSCS-19** and **Fatima Yousaf** Roll. No **0279-r-BSCS-19** under my supervision.

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Dedication

My research work is dedicated to my family and my honorable teacher prof Dr. Syed Asad Raza Kazmi who encouraged and helped me to complete my research in the area of formal modeling and formal verification related to computer science.

Abstract

The "Track my Shop" project aims to address a significant issue prevalent in the digital era, where small businesses such as service providers, mini stores, and repair shops struggle to establish an online presence due to cost constraints. In response to this, we propose the development of a Web Application Software that acts as a centralized platform for local businesses to connect with their local customer base. By leveraging this application, shopkeepers can extend their reach and increase their earnings by reaching more customers online. Customers, in turn, can easily access and purchase products or avail services from nearby local shops within their specified geographical proximity. The project integrates an image recognition service, allowing sellers to effortlessly add products or services by simply uploading images. On the customer side, this service facilitates image-based search, enhancing the user experience and streamlining the purchasing process.

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Chapter 1

Introduction

1.1 Introduction

In an era characterized by rapid technological advancements, businesses are constantly seeking efficient, automated, and precise solutions to streamline their operations. This paradigm shift has led to the creation of numerous software programs tailored to meet the diverse needs of different industries, facilities, and various workplaces. Historically, manual methods were employed for data management, but evolving preferences have spurred a transition to digital solutions. Recognizing the digital divide prevalent among small businesses, particularly those serving local communities, this project, "Track My Shop," endeavors to empower these enterprises and enable their seamless integration into the online marketplace.

In today's digital landscape, the majority of businesses across sectors have embraced online platforms to market and sell their products and services, swiftly reaching customers through home deliveries. However, smaller businesses such as service providers, mini stores, repair shops, and local vendors, including cobblers, barbers, milk shops, bakeries, and spare parts shops, often find it financially challenging to establish an online presence. The "Track My Shop" web application sets out to address this disparity by providing local shops a centralized online platform to connect with their local customer base. Through this application, shopkeepers can significantly broaden their customer reach, attract a larger audience, and consequently, enhance their earnings with minimal effort of input.

The project envisions simplifying and modernizing operations for local businesses by integrating innovative features such as image recognition for effortless addition of products services, and image-based search capabilities for customers.

1.2 Project Overview

The proposed system, "Track My Shop," is a web-based application designed to facilitate the seamless creation of online shops for sellers. Utilizing image recognition technology, sellers can effortlessly add products or services to their online shop by capturing or uploading images. The system automatically identifies and categorizes the items, making them readily accessible to customers in the vicinity of the shop. Conversely, customers can easily browse and search for products or services using images, names, or proximity filters. They can initiate requests for product delivery or obtain directions to the seller's physical shop, enhancing their overall shopping experience.

1.3 Problem Statement

In the contemporary business landscape, small enterprises encounter a significant barrier in establishing an online platform for their operations due to prohibitive costs associated with web development and maintenance. The high financial investment required often restricts their ability to tap into the potential of the digital marketplace, limiting their growth and outreach.

Furthermore, the traditional method of manually inputting products and services into an online platform has become increasingly burdensome and time-consuming. This arduous process not only consumes valuable time but also poses a hindrance to the efficient management and scaling of businesses, leading to decreased productivity and suboptimal user experiences.

In addition, both customers and local shops face challenges in connecting efficiently. The conventional approach of physically visiting or relying on word-of-mouth recommendations to discover shops or services is cumbersome and time-intensive. This lack of a seamless and convenient means to connect customers with local shops impedes the potential for increased business transactions and growth for these small enterprises. Therefore, an effective solution is imperative to address these pressing issues and bridge the existing gap between small businesses and their online presence while enhancing accessibility and connectivity for both customers and shops.

1.4 Study Limitations

The primary challenges that impeded the advancement of this project were time and financial constraints. The project involved various financial obligations, including expenses for software development, server deployment, image recognition technology, and geolocation features. Additionally, managing fieldwork, development tasks, and adhering to project timelines was demanding. Despite these constraints, we remained committed to ensuring the accuracy and effectiveness of the web application, striving to meet the expectations and needs of both sellers and customers.

1.5 Literature Review

"Track My Shop" embodies the essence of modern business augmentation through technology. In an era where online presence is paramount, this web application offers a cost-effective solution for small and local businesses to establish their digital footprint. By seamlessly integrating products and services using image recognition and geolocation features, the application enhances accessibility and connectivity between customers and local shops. It paves the way for an intuitive and efficient shopping experience, bridging the gap between traditional brick-and-mortar stores and the vast digital market. The project encapsulates the vision of empowering businesses and customers alike, promoting growth, efficiency, and a seamless convergence of technology and commerce.

Chapter 2

Requirement Specification

2.1 Functional Requirements

Function and features that derives to the end user of the system are following:

2.1.1 Affordable Online Presence:

Develop a cost-effective solution that enables small businesses to establish and maintain an online platform for their products and services without incurring prohibitive expenses, democratizing access to the digital marketplace.

2.1.2 Streamlined Product/Service Integration:

Create an automated system leveraging image recognition technology to simplify and expedite the process of adding products and services to the online platform, reducing manual effort and improving efficiency for business owners.

2.1.3 Enhanced Customer-Shop Connectivity:

Facilitate easy and efficient connection between customers and local shops by providing a user-friendly interface that allows customers to search for products or services based on images, names, or location, thereby fostering a seamless shopping experience.

2.1.4 Geolocation Features:

Implement geolocation features to enable customers to explore nearby shops and their offerings, aiding in quicker decision-making and fostering a stronger connection between customers and local businesses.

2.1.5 Delivery Request Mechanism:

Integrate a system that allows customers to request product delivery from the respective sellers, promoting convenience and encouraging increased sales for the shops while enhancing customer satisfaction.

2.1.6 Navigation Assistance:

Provide navigation features that guide customers to the physical locations of shops, improving accessibility and encouraging more foot traffic to the local businesses, ultimately boosting their visibility and sales.

2.1.7 User Experience Optimization:

Prioritize an intuitive and appealing user interface and experience to ensure that both sellers and customers find the application easy to use and navigate, enhancing overall satisfaction and encouraging continued usage.

2.1.8 Search History Recording:

Record customer searches to provide a history for their convenience and future reference.

2.1.9 Comprehensive Search Results:

Ensure that search results include a wide array of products, services, and corresponding shops for a complete view of available offerings.

2.1.10 Flexible Result Filtering:

Allow customers to filter search results based on various criteria such as price, ratings, shop proximity, or categories, enabling a personalized and efficient shopping experience.

2.1.11 Delivery Requests for Products:

Implement a mechanism for customers to request product delivery, promoting convenience and seamless transactions.

2.1.12 Navigation to Shops:

Enable customers to obtain directions to the physical shops offering the desired product or service, facilitating a smooth transition from online exploration to in-person shopping.

2.1.13 Category-Based Exploration:

Provide an option for customers to explore products and services based on categories, allowing for effortless browsing without initiating a specific search.

2.2 Non-functional Requirements

Here are the non-functional requirements:

2.2.0.1 Performance

- The web application must have rapid response times and load efficiently.
- API calls for data fetching and processing should complete within milliseconds for a seamless user experience.
- The application should maintain high performance even during peak usage.

2.2.0.2 User Interface (UI) and User Experience (UX)

- The UI should be intuitive, aesthetically pleasing, and utilize vibrant colors with smooth animations.
- The design should be consistent and compatible across various screen sizes and devices.
- User interactions and transitions within the application should be smooth and visually appealing.

2.2.0.3 Compatibility

- The web application must be compatible with a wide range of browsers, ensuring consistent functionality and appearance across different platforms.

2.2.0.4 Scalability

- The architecture should allow for seamless scaling to accommodate a growing user base and increased data load.
- The application should be capable of handling increased traffic without compromising performance.

2.2.0.5 Accessibility

- The application should adhere to accessibility standards to ensure usability for individuals with disabilities.
- Content and features should be easily navigable and understandable for users with basic English skills.

2.2.0.6 Image Storage

- Images should be stored securely in AWS S3 buckets, ensuring data integrity and accessibility.
- The image storage system should handle image uploads, retrievals, and deletions in an efficient and organized manner.

2.2.0.7 Database Management

- The database should be maintained automatically, including regular password changes for enhanced security.
- Database operations should be optimized to ensure data retrieval and modification are swift and efficient.

2.2.0.8 Response Time

- The web application should have minimal loading time, providing near-instantaneous responses to user actions.

2.2.0.9 Reliability

- The application should operate consistently without frequent crashes or downtimes, ensuring a reliable user experience by instantly report and monitor any bugs or errors, enhancing application reliability.

Chapter 3

Project Design

3.1 Methodology

3.2 Architecture Overview

A sample for mathematical writing

A team of three robots moving in an environment that is modelled by G. Motion primitives of robots are given by the transition system $\mathbf{T}$=(Q_T, q_T^0, δ_T, Π_T, L_T, w_T), where Q_T⊆V, q_T^0 is the initial vertex, δ_T⊆e is a relation that models the capabilities of robot to move along the vertices, Π_T⊆Π presents the set of propositions that a robot satisfies, L_T is mapping that how propositions are satisfied at some vertex and w_T is weight that a robot went from one vertex to another.

3.3 Design Description

Another format

$$\phi := \psi \wedge GF\sigma \tag{3.1}$$

Chapter 4

Implementation and Evaluation

4.1 Development Stages

the following ...

4.1.1 Stage abc..

Another example how to add reference

The concept is given in [**?**]

4.1.2 Stage def..

4.2 System Integration

4.3 User Interface

4.4 Evaluation

4.5 Unit Testing

4.6 Functional Testing

4.6.1 Testing Requirements

4.7 Requirements

Some more samples of tables

Another sample for Table

Algorithm 1: Group-TS

Input: Transition system of each member $\{T_1, T_2, T_3\}$.

Output: Combined Transition System of members that is **T**.

1. Let m = 1, 2, 3
2. $q_T^0 = q_m^0$.
3. recursive search on **T** starting from initial state (q_T^0).
4. $q_m \in$ q.
5. The transition of T_m is defined as $\rightarrow_m$. where $\rightarrow_m$ = (q,q')
6. τ : set of possible transitions and $\rightarrow_m \in \tau$ then do.
7. ω = minimum weight of $\rightarrow_m$ when the robot finds some region.
8. Find new state of transition system that is q' and if q' not exists then.
9. Insert the state q' to **T**.
10. Insert new transition to δ_T with assigning the weight ω. where δ_T is the set of transitions.
11. prolong search from new state q'
12. else if there is no transition for (q,q') then
13. Include transition that is from (q,q') to δ_T with assigning the weight ω

TABLE 4.1: **(a)** Results after running the Transition System

$\mathbb{T}$	0	2	3	4	6	8	10	...
$r*_{group}$	q_0,q_0,q_0	q_1,q_1,q_1	q_1q_01,q_2,q_3	q_0,q_1,q_2	q_1,q_0,q_3	q_0,q_1,q_2	q_1,q_0,q_3	...
$L_T(.)$	.	p_1,p_2,p_4,σ	p_3,p_5	p_2,p_6,σ	p_1,p_5,σ	p_2,p_6,σ	p_1,p_5,σ	...
r_1*	q_0	q_1	.	q_0	q_1	q_0	q_1	...
r_2*	q_0	q_1	q_2	q_1	q_0	q_1	q_0	...
r_3*	q_0	q_1	q_3	q_1	q_0	q_1	q_0	...

We assume in Table 4.1 the first row shows the time when the transition occur, second row represents the run $r*_{group}$, third row corresponds to the satisfied propositions, and last three rows shows the separate run of these three robots. We observed in the optimal run that (q_0,q_0,q_0), (q_1,q_1,q_1), (q_1q_01,q_2,q_3) is prefix and (q_0,q_1,q_2), (q_1,q_0,q_3) is suffix cycle and that will be repeated an infinite number of times. The given time which satisfies the σ is $\mathbb{T}^\sigma$ = {2,4,6,8,10,...} and the function defined in (3.2) is $C(\mathbb{T}) = 2$.

Now, the time sequence when σ is repeatedly satisfied is $\mathbb{T}^\sigma$ = {2,4,6,8,10,...} and cost function is given as;

$$C(\mathbb{T}) = \lim_{k\to+\infty} (\mathbb{T}(\text{k+1}) - \mathbb{T}(\text{k}))$$

$$= \mathbb{T}(\text{k+1}) - \mathbb{T}(\text{k})$$

$$= 4 - 2 = 2$$

As $C(\mathbb{T}) = 2$ is the obtained function where the σ is repeatedly satisfied. At t=3, robot2 has reached at q_2 while the robot1 is still moving from q_1 to q_0, therefore r_1* has no correlated state to t=3.

4.7.1 Accurate Specified Run

In Algorithm.2 the exact solution is summarized and it shows that a particular solution is given to a specified problem for that case where robots have exact time information.

Algorithm 2: Accurate-Run

Input: $\{T_1, T_2, T_3\}$ & LTL formula ϕ.

Result: Different runs of each system in the form $\{r_1*, r_2*, r_3*\}$ that satisfies ϕ.

1. n = 1, 2, 3
2. Model the group transition system **T**.
3. Now search runs $r*_{group}$ for the system as done in Table.1.
4. Trace runs $r*_{group}$ on the transition systems T_n to obtain the runs r_n*.
5. Then find obtained function where σ is satisfied.

As the grouped transition system **T** is constructed by using Algorithm.1 to model the team. After that we obtain a run $r*_{group}$ on **T** that satisfies the LTL formula.

TABLE 4.2: **(b)** Results after running the Transition System

$\mathbb{T}$	0	2	3	4	5	6	7	8	9	...
$r*_{group}$	q_0,q_0,q_0	q_1,q_1,q_1	q_1q_01,q_2,q_3	q_0,q_1,q_2	q_0q_11,q_2,q_3	q_1,q_1,q_1	q_1q_01,q_2,q_3	q_0,q_1,q_2	q_0q_11,q_2,q_3	...
$L_T(.)$	.	p_1,p_2,p_4,σ	p_3,p_5	p_2,p_6,σ	p_3,p_5	p_1,p_2,p_4,σ	p_3,p_5	p_2,p_6,σ	p_3,p_5	...
r_1*	q_0	q_1	.	q_0	.	q_1	.	q_0	.	...
r_2*	q_0	q_1	q_2	q_1	q_2	q_1	q_2	q_1	q_2	...
r_3*	q_0	q_1	q_3	q_1	q_3	q_1	q_3	q_1	q_3	...

Now similarly in Table 4.2 the first row shows the time when the transition occur, second row represents the run $r*_{group}$, third row corresponds to the satisfied propositions, and last three rows shows the separate run of three robots. As we observed in the optimal run that (q_0,q_0,q_0), (q_1,q_1,q_1) is the prefix and (q_1q_01,q_2,q_3),

(q_0,q_1,q_2), ($q_0q_1$1,q_2,q_3), (q_1,q_1,q_1) is the suffix cycle and that will be repeated an infinite number of times. The given time which satisfies the σ is $\mathbb{T}^\sigma = \{2,4,6,8,10,\ldots\}$ and the function defined in (3.2) is $C(\mathbb{T}) = 2$.

Now as we done in Table 4.1 similarly the same procedure for this run shown in Table 4.2, the time sequence when σ is repeatedly satisfied is $\mathbb{T}^\sigma = \{2,4,6,8,10,\ldots\}$ and cost function is given as;

$C(\mathbb{T}) = \lim_{k\to+\infty}$ ($\mathbb{T}$(k+1) - $\mathbb{T}$(k))

= $\mathbb{T}$(k+1) - $\mathbb{T}$(k)

= 4 - 2 = 2

As $C(\mathbb{T}) = 2$ is the obtained function where the σ is repeatedly satisfied.

For some applications including new states and corresponding transitions to the structure of the robotic system may indicate to introducing advance stages or motion commands at some lower level. So the proper way in which the changes of these models are strictly application specific and we do not consider such details in our work. Assuming that these changes can be implemented in future.

4.7.2 Synchronized Specification

If there is a situation in which robots are moving at uncertain time and ϕ is not satisfied then we consider individual synchronization run for the robots that helps in guarantee the correctness of the model. In Algorithm.3 the protocols which is followed by the robots for synchronization in the field.

Algorithm 3: Synchronized-Move

Input: r_i and sequence s_i of $robot_i$

Result: Simple synchronized moves for each robot that satisfies ϕ.

- Initialized z at 0 and while True do

1. report all the members.
2. wait until all members received their information message.
3. after satisfying propositions at r_i^z create a transition to r_i^{z+1}.
4. z = z+1.

Chapter 5

Conclusion & Future Work

Figure 5.1: Result after simulation

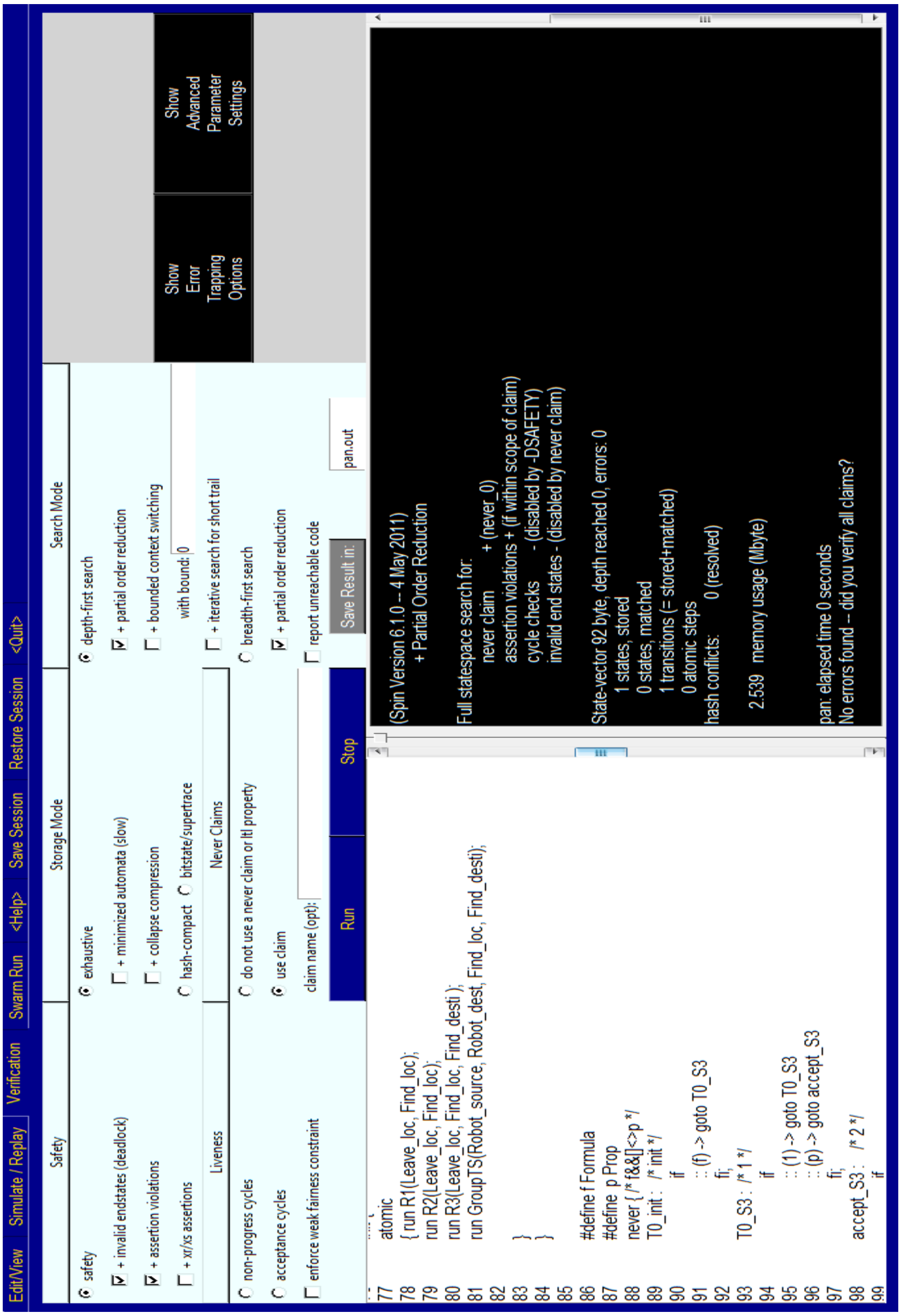

FIGURE 5.2: Result after verification

5.1 Conclusion

A method is presented in this work for modeling the concurrent activities of a group of robots using temporal logics. The specifications are expressed in LTL formula and an algorithm is provided to model the transition system for the group of robots. Our method is optimal in a computational way as compared to previous methods, in which they constructed a model that captures all group members and their mission specification. The main drawback is the complexity of previous models that are time consuming processes.

Our approach is optimal to handle such cases where robots can take an action after confirmation of path availability according to the plan, and in some applications they has practical value where a series of different tasks performed by multiple robots in an environment. For some applications including new states and corresponding transitions to the structure of the robotic system may indicate to introducing advance stages or motion commands at some lower level. So the proper way in which the changes of these models are strictly application specific and we do not consider such details in our work. Assuming that these changes can be implemented in future.

Appendix A

Appendix Title Here

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Bibliography

[1] http://scribd.com.

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