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Role of Robotic Process Automation and Navigation System in Transport Sector

Ranu Pareek[1], Sofia Khan[2], Dr. R. K. Tailor[3], Mona Kumari[4], Karan Ashok Jalwani[5]

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Abstract: Robotic process automation in transportation can lead to a setting that allows for semi- or completely autonomous navigation. In semi-autonomous mode, the system accepts conventional motion instructions through voice activation or a standard joystick interface and provides robotic movements with obstacle and collision avoidance features. While the fully autonomous mode trials are highly encouraging, the sparsest or semi-automation navigation option is the sparsest or semi-automation navigation mode. Financial savings, higher quality, and better customer experience are just a few of the advantages of robotic process automation (RPA).RPA is a technical application that uses business logic and structured input to automate business tasks. Using RPA technology, a company may develop software, or a "robot," to record and understand applications for processing a transaction, modifying data, triggering responses, and integrating with other digital systems. Businesses may utilize RPA to automate mundane rules-based business procedures, freeing up business users' time to focus on customer service or other higher-value duties. It is crucial to the advancement of public transport. However, the company is currently experiencing major difficulties. The primary goals of this research are to assess the operational and financial performance, as well as the function of robotic navigation systems in the transportation industry. This research uses both primary and secondary data. It contains interviews with different metrics for data analysis that include operational and financial characteristics such as fleet, collection, and passengers, among others. A navigation system is a two-way communication system, similar to a digital telephone, that connects with a central service center to ascertain the user's actual location and navigational information. Ideally, a human-to-human information interface is provided. Some of the components can be stored at a remote and fixed base station due to the usage of a two-way communication system.

***Keywords**: Robotic Process Automation, Tracking, Navigation, Transport, System, Global Positioning System(GPS).*

Introduction

Robotic process automation, often known as RPA, is a form of software that imitates the way people interact with software to complete high-volume activities in a repeated manner. This type of software is typically referred to by its acronym. The RPA technology makes it possible to create software programs, which are also referred to as bots in certain circles. These bots are capable of logging into applications, inputting data, computing and completing tasks, and duplicating data across processes or apps as necessary. It is a technique that employs software agents (bots) to do typical clerical work in the absence of human intervention. RPA is effective for automating rule-based and repetitive business operations. RPA bots can execute a workflow that spans many applications and multiple phases. Unlike conventional automation initiatives, which need considerable developer assistance, RPA programs rely only on an organization's current applications. A navigation system may be a (usually electronic) method of accurately determining one's position and designing a route. Navigation systems can also be whole aboard a vehicle or vessel (on the ship's bridge), or they can be situated elsewhere and communicate with a vehicle or vessel through radio or different signals, or they can utilize a combination of those tactics. The navigation system has numerous applications for blind people,, incapacitated for, or wheelchairs. GPS (Global Positioning System) is the most widely used navigation system worldwide.

Navigation Systems can be distinguished into three types Indoor Navigation Systems, Outdoor Navigation Systems, and Hybrid Navigation Systems. The navigation system has various applications in different fields. The outdoor navigation system uses GPS (Global Positioning System) for all applications like traveling, for blind people, ships, aircraft, etc. Indoor navigation is slightly more critical than outdoor navigation systems, as GPS cannot be used inside the building, lift, home, etc. For Indoor

[1]Department of Business Administration, School of Business and Commerce, Manipal University Jaipur, Jaipur, India (ranupareek655@gmail.com)

[2] Department of Business Administration, School of Business and Commerce, Manipal University Jaipur, Jaipur, India

[3] Department of Business Administration, School of Business and Commerce, Manipal University Jaipur, Jaipur, India

[4] Department of Economics, Patna Women's College, Patna, India

[5] Department of Mechatronics, School of Engineering, Manipal University Jaipur, Jaipur, India

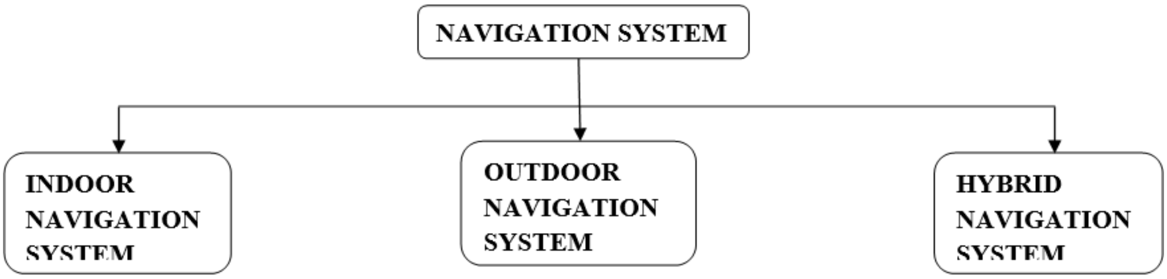

Fig 1. Navigation System Types

Navigation, we have to create navigation applications, especially for that part of indoor places such as complex buildings(1). A hybrid navigation system is the combination of one or more navigation systems. To improve the efficiency, a hybrid navigation system is used. A self-driving car is one of the best examples of hybrid navigation to ensure continuous knowledge of the position of the car. The navigation system has various applications, mostly for medical help. Navigation System also helps satellites with signal reception(2).

This paper provides various navigation systems and their applications. In the first section, we discuss the indoor navigation system, how it is used, and where it can be advantageous. In the second section, we discuss the Outdoor navigation system for vehicles, aircraft, underwater, satellites, blind pedestrians, and many more. In the third section, we discuss the Hybrid navigation system which can be used at both places for indoor as well as outdoor. In the fourth section, we discuss the application-based navigation system paper where we can discuss where the navigation system is used in our daily lives(3).

Indoor Navigation System The indoor navigation system is a network of sensors that iareused to identify people or objects in environments where GPS and other satellite technologies are either ineffective or fail to function properly. Some examples of these environments include multistory buildings, airports, alleyways, parking garages, and subterranean places(4). Indoor positioning is given through a variety of methodologies and devices, including modified equipment that is currently in use, such as telephones, Wi-Fi and Bluetooth antennas, digital cameras, and clocks;t o custom-built systems that strategically place relays and beacons within a defined area. IPS includes a variety of commercial, military, retail, and inventory monitoring applications. There are no standards for an IPS system, even though many commercial systems are available. Instead, each installation is tailored to the area's size, building materials, individual demands, and economic constraints. In IPS networks, lights, radio waves, magnetic fields, audio signals, and behavioral analytics are all employed(4). This study examines both the current state of the art and potential future advancements in indoor positioning, localization, and navigation (PLAN). It discusses the needs, key actors, sensors, and indoor PLAN methodologies. Environmental perception sensors such as HighDefinition maps (HD map), Light Detection and Ranging (LiDAR), cameras, the fifth generation of mobile network connection technology (5G), and Internet (IoT) signals are becoming essential helping sensors for PLAN. The introduction of increasingly powerful sensors, multiplatform/multidevice/multisensor information fusion, Self-learning systems, as well as integration with artificial intelligence, 5G, IoT, and edge/fog computing, is expected to improve the intelligence and durability of PLAN systems. The test area was 5 m x 5 m x 2.84 m, and it had five CREE T6 Light-Emitting-Diodes (LEDs) evenly spaced over the ceiling as light beacons(5). The experiment's receiver consisted of an OPT101 photodiode and the front camera of a smartphone. The receiver was installed at a height of 1.25 m on a mobile robot. The proposed system generated a semi-real-time positioning solution with an average 3D positioning accuracy of 15.6 cm in dynamic testing. When more sensors are employed, the accuracy is likely to improve even further (5).

As a result of the widespread usage of indoor positioning technologies, indoor navigation systems have been used to guide people to their destinations in a variety of large institutions, including hospitals, airports, and railway stations, to name a few. A 2D-floor map displaying a path to the goal is a typical user interface seen on smartphones. When users arrive at an intersection, the navigation directions on the screen turn left, turn right, and go straight commands are shown. Unfortunately, due to the limits of a 2D navigation map, users may feel mental strain and uncertainty before departure while attempting to blend the real surroundings with the 2D navigation map(6). This is because the 2D navigation map cannot accurately represent the real surroundings. ARBIN is an augmented reality navigation system that, as a direct result of this, shows journey instructions on the screen based on actual places in the world. Because of this, users are excused from the need they link the route instructions and the actual surroundings they are in at the time of their journey. To determine whether or not ARBIN is applicable, several tests were run in the outpatient section of the Yunlin Branch of the National Taiwan University Hospital. These tests were carried out to examine the application of ARBIN. The outpatient area is over 1800 square meters in size and features 35 destinations and places of interest, including a cardiology clinic, an X-ray examination room, a pharmacy, and other enterprises that are analogous to these kinds of locations(7). For the experiment, four different types of cell phones were tested. ARBIN is made up of four modules, as shown in Figure 2: indoor location, route planning, motion tracking, and installation of AR 3D models are all possible. At first, the user-selected destination is passed to the route planning module, which determines a path to the destination. ARBIN has shown to be an excellent interior navigation system, especially in large structures (9).

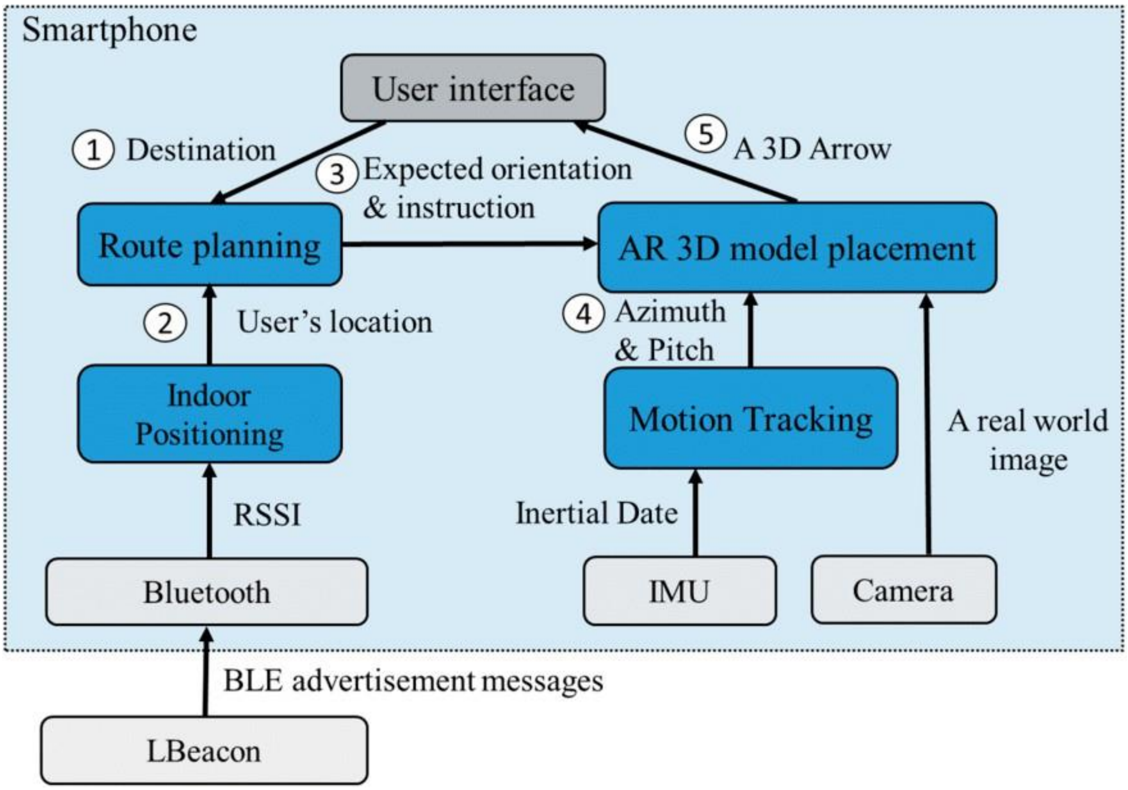

Fig 2. ARBIN system architecture. Source: (8)

Because of the destruction created by the coronavirus infection, the role that technology plays in our day-to-day lives is shifting. Particularly in confined spaces, the movement of people in particular has to be controlled or directed to alleviate congestion. In this study, we describe an interior navigation system that is both efficient and cost-effective, wto facilitatethe movement of people throughout big smart buildings. Our strategy makes use of a recently developed technology for wireless communication over short ranges called Bluetooth Low Energy (BLE), which is based on the Internet of Things. Additionally, we disperse BLE beacons throughout the surrounding area itooffer guidance to mobile users who are equipped with smartphones(10). The most important scientific contribution made by our work is a one-of-a-kind navigation system that is based on proximity and recognizes the user's position based on the information provided by beacons, identifies the best internal navigation path at the edge of the computing infrastructure, and delivers the information to the user. Smartphones are the medium via which it is distributed to end users. We present some experimental findings that might be uutilizedin the assessment of the communication system, taking into consideration the "Received Signal Strength Indicator" (RSSI) as well as the "Mean Opinion Score" (MOS). This article discusses a novel, low-cost, and scalable system for indoor navigation that includes indoor mapping, localization, and navigation. The system can be scaled up to accommodate a larger number of users. With this technology, we can help smartphone users navigate smart buildings by determining their location over time and pointing them in the direction of the most efficient path to their final goal. The findings of the trials demonstrate how beacons may be altered depending on their relative distance and/or transmission power by the specific constraints of the site where they are positioned (11).

Interior navigation systems are highly helpful in large, complex indoor spaces like retail malls. Examples of these kinds of areas include hospitals and airports. For existing technologies to be able to deliver realistic inside navigation services, the focus has shifted to enhancing "indoor localization accuracy." These technologies must be utilized in conjunction with an appropriately designated floor plan. It is typically either impossible or too expensive to hand-get such annotated floor drawings. IndoorWaze is a ground-breaking crowd-sourcing-based context-aware indoor navigation system that can produce an accurate context-aware floor plan with annotated indoor POIs. The system is called IndoorWaze.com. The business IndoorAtlas is responsible for the development of IndoorWaze. IndoorWaze can build a floor plan that has been labeled with a high level of accuracy because it integrates the Wi-Fi fingerprints of individuals who walk indoors with the POI labels that are supplied by the people who work at the POI locations. Because IndoorWaze is a lightweight crowd-sourcing-based system, it requires a relatively small amount of labor from both the individuals who stroll indoors and the people who work at POIs. The Android-compatible navigation software known as IndoorWaze underwent testing at a big shopping ccentershortly after it was released. Based on our research, we can conclude that IndoorWaze is capable of creating a llabeledfloor plan with a high level of precision. This plan has all of the stores appropriately named and sorted, all of the passageways and crossings are depicted in the appropriate locations, and the median estimation error for the store dimension is less than 12 percent. The

architecture of our system is depicted in Figure 3. IndoorWaze initially creates walking paths for customers based on their inertial measurement unit (IMU) sensors. The walking traces are then saved for further use in floor plan development. Next, to discover which stores people visited while walking, we compare the RSS fingerprints of customers and store workers. The technology then integrates and combines walking traces from various consumers to produce a labeled floor layout. IndoorWaze also recognizes paths in the floor plan and connects merchants on both sides of each corridor to increase the floor plan graph's connectivity (8).

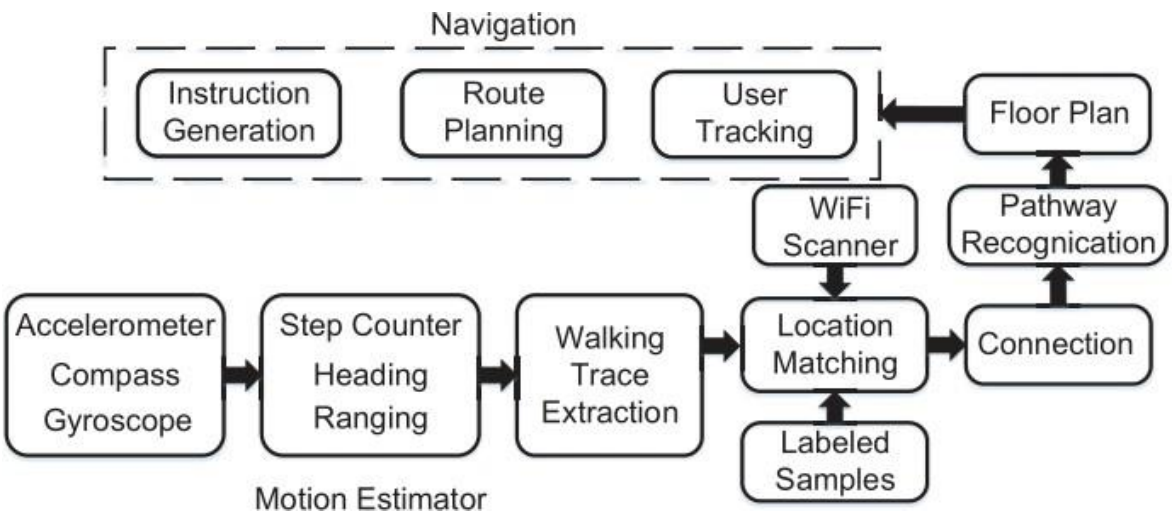

Fig 3. Architecture of the IndoorWaze system. Source: (9)

This article explores the advantages and disadvantages of currently available indoor navigation systems before detailing a study that employed commercial smart devices to navigate pathways through a huge building. Our objective was to compare performance while using real-time narrative descriptions (system-aided condition) vs. a memory-based condition in which the same narrative material was only supplied to users beginning with the route's genesis. We looked at two groups of blind and visually impaired (BVI) people, both over and under the age of 60, as well as a sighted control group. Evaluating older BVI participants is critical because the majority of vision loss comes with age, even though navigation ability with access technology is rarely evaluated with this group. Behavioral results showed that blind users with access to real-time (system-aided) information had superior navigation accuracy and confidence than those with information-matched memory. The performance of blind individuals over the age of 60 was substantially equal to that of their younger peers—an important finding that supports the usefulness of employing navigational tools by this rapidly rising group. When using the system, blind and sighted participants' route completion accuracy and requests for assistance did not differ reliably, implying that access to narrative route information resulted in functionally equal navigation behavior independent of visual status. The survey results revealed significant user support for real-time information and provided critical ideas for future interface enhancements (12).

A one-of-a-kind navigation system for the Fetch robot in a large-scale environment based on ssub-mappingmethods. This indoor navigation system has two components: submap mapping and online localization.

To deal with large settings or multi-story constructions, Google Cartographer presents a submap mapping architecture that combines ta wo-dimensional (2D) laser scan and ta hree-dimensional (3D) point cloud from Ran GBD sensor. Meanwhile, the RGBD sensor generates

various picture files with related stances. Because of the submap structure, the mistake is restricted to the size of the map, which improves localization accuracy. To switch the ssub mapson-the-fly, DeepLCD, a deep learning-based library for loop closure, is used to match the on-the-fly images from the RGBD sensor with the database images. To finish the localization process, adaptive Monte Carlo localization (AMCL) is reinitialized utilizing DeepLCD and odometry information. Reflectors and a motion capture system are used to compute the absolute trajectory error (ATE) and the relative pose error (RPE) using the Gaussian Newton (GN) approach to ensure that the results are valid. Finally, the suggested framework, which incorporates both submap mapping and online localization, is tested using both the Fetch simulator and the real Fetch robot (13).

Outdoor Navigation System Mobile map tools like Google Maps may not always give precise information on facility sites like amusement parks and university campuses. Furthermore, some persons are unable to find their location simply by reading a flat map. As a result, in this study, to overcome these challenges for facilities, we created AR (augmented reality) navigation software. Furthermore, we might increase the accuracy of AR object display by utilizing Kalman filtering to estimate user location. Figure 4 depicts a schematic design of this system. The client app was created using the Maps SDK for Unity, the

Mapbox SDK for Unity, and the AR Foundation, a Unity-based AR platform. The server is primarily made up of Mapbox services. There are two types of services to use: maps, which provide map data, and navigation, which provides route information. The static image API and vector tiles API, which are part of the maps service, are used, as are the directions API, which is part of the navigation service. Inertial sensors, global positioning systems (GNSS), and magnetometers are examples of sensor data. Because this program is used in the field, a cellular network is commonly used to connect to the cloud-hosted server. To acquire map and route data, a device must be connected to the Internet, but because the system does not connect to the Internet during navigation, after saving wayfinding information, it can be used offline. The Mapbox API was used for route acquisition in this project; however, proper navigation may be impossible, depending on the facility. In such cases, a route acquisition and registration system would be required (15).

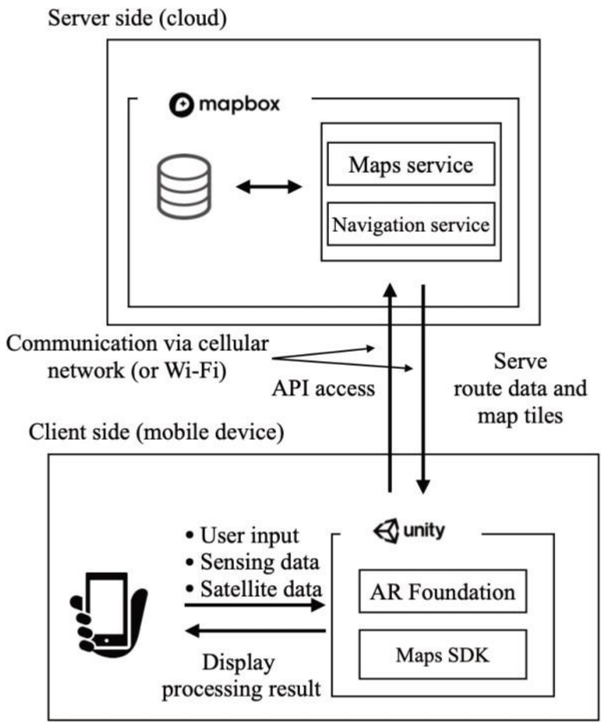

Fig 4. Overview of the system. Source: (14)

Riding is becoming increasingly popular as a green and ecologically beneficial mode of transportation; however, there are currently few safe navigation systems designed specifically for cyclists. As a consequence, the research suggests a truly intelligent navigation system with a simple structure, practical functionality, and high dependability according to "audio navigation." The solution, which is incorporated into the system, consists of "smart hardware plus APP plus data platform." This article goes into great depth on the concept and design plan for a new type of intelligent bicycle riding navigation system that is based on "audio technology." This system has advantages such as high security, easy operation, zero flow, no network limitations, and comprehensive features, among other benefits. Cycling while wearing headphones makes it impossible to be aware of the security concerns posed by external ambient sounds; as a result, the development of a specific application is required to provide riders with safe and convenient travel options. Since wearing earbuds for an extended period can cause damage to the "ear canal," using headphones while cycling makes it impossible to be aware of the security concerns posed by external ambient sounds. It is possible that in the not-too-distant future, we will attempt to integrate "audio technology" with "visual technology" to develop a new intelligent bicycle navigation system, which will make cycling safer and reduce the potential hazards associated with being in traffic (16).

A solution that is both low-cost and effective for resolving the issue of navigation faced by mobile wheeled robots in both indoor and outdoor settings. The system that has been provided here is founded on a probabilistic methodology for the fusion of many sensors, and it makes use of inexpensive inertial and visual sensors. With the EKF technique, a low-cost depth sensor is utilized for the inside environment, where GPS signals are impeded from being received (Microsoft Kinect stream). It has been proposed and shown to be effective to use a hybrid low-cost reduced navigation system (HLRNS) for both indoor and outdoor settings, and this concept has been examined through modeling as well as in actual situations. In this scenario, a technique known as "input-output state-feedback linearization" (I-O SFL) is used to manage the robot and keep an eye on the trajectory that is being projected. This method was developed by the University of California at Berkeley. The proposed HLRNS displays performance levels that are acceptable for use in real-time application deployments, as determined by the results of validation, simulation, and experimental testing. In order to improve the localization and navigation capabilities of mobile robots, EKF will be developed and finally put to use in the field. After receiving input from the encoder, compass, inertial measurement unit (IMU), and GPS, the EKF algorithm will determine the position and orientation of the robot based on the data it receives. Wheel encoders, a "reduced inertial sensor system (RISS)," and a "Global Positioning System (GPS)," were utilised in the evaluation of the robot's posture in the external environment for the purpose of determining the efficacy of the EKF. This evaluation was done in order to determine the effectiveness of the EKF. In order to locate the robot in the inside environment, where GPS signals are obscured, the EKF method makes use of a feature-based map representation in conjunction with the Microsoft Kinect V2 sensor and a few additional sensors that are quite inexpensive. The EKF algorithm was applied so that a prediction could be made regarding the posture of the robot in reference to the map markers. In order to verify the findings, we conducted certain experiments. The performance of the fusion architecture is compared to that of a system that is "commercially available off the shelf" (COTS) that uses UKF as its fusion engine. It was discovered that the robot has the ability to follow the trajectory of the target with an accuracy of 0.3 metres (17).

Robotic Process Automation

Automation has allowed businesses to do more with less across all industries, reducing costs while raising accuracy and output. On the other hand, traditional automation is frequently dependent on programming, with high-code apps interacting with the proper systems. RPA provides a unique method for completing tasks at the user interface level. Furthermore, because RPA bots are meant to mimic and learn from human activities, no modifications to the underlying architecture are required (18). RPA robots can be attended or unattended, depending on whether they require human aid or monitoring.RPA, in essence, automates particular types of actual human operations as well as large-scale data movement activities, allowing it to handle repetitive, tedious, and rule-based jobs and obligations swiftly and effectively.Robotic Process Automation refers to the process of automating company procedures with the use of robots to decrease human interference (RPA) (19). Robotic Process Automation (RPA) is the process of automating corporate procedures with the use of robots (bots) to eliminate the need for human interaction. RPA (Robotic Process Automation) enables businesses to automate processes throughout systems and applications in the same manner that a human would. RPA's purpose is to move the operation away from humans and to bots. Robotic process automation integrates with the existing IT infrastructure without requiring complex system integration.RPA automation can automate labor-intensive workflow, infrastructure, and back-office procedures. These software bots can communicate with an internal application, website, user portal, etc. RPA is an abbreviation for Robotic Process Automation. Robotic Process Automation is a software application that operates on the computer, laptop, or mobile device of the end user. It is a series of instructions that are performed by Bots in accordance with a set of business rules.The fundamental goal of robotic process automation is to replace people with the a virtual workforce for monotonous and time-consuming clerical tasks (20). Coding is not required for RPA automation, nor is direct access to the application's code or database required.

How Robotic Process Automation and navigation will be useful in transport sector -Physical chores that were formerly regarded to be done by humans are now undertaken by machines to reduce the load of labour on people.Nonetheless, there is a requirement that computers not only do physical activities but also reason and make decisions in the same way that humans do.Artificial intelligence knowledge has been taken into account to make things intelligent and achieve this goal.Automation of robotic processes and navigation system (21). Obstacle avoidance and path follow-up are fundamental issues in mobile robotic systems. The goal of navigation is to find the best path from the start point to the target position in a congested environment.Fuzzy logic is crucial in robotic process automation and autonomous guided vehicle control. They work best with faulty and imprecise sensor data and heuristic-based knowledge. Intelligent cars with two fuzzy controllers merge with vehicle control direction to help drivers on the road and occasionally perform the driver's position to reduce accidents. Researchers have been observed to concentrate presently on minimizing time and computing difficulties in robotic path planning (22). Path planning entails a number of aspects that must be addressed in order to provide the best potential outcomes, including path length, stability, efficiency, and vehicle safety, which is the most crucial of all. The use of robotic process automation (RPA) is continuing to reshape logistics (23). Companies use Robotic Process Automation (RPA) in logistics to better handle shipments from their fulfillment centers to consumers and businesses all over the world. Using RPA in transportation is critical to managing by exception and achieving numerous efficiency and cost savings.One of the advantages of employing RPA in transportation is the ability to automatically track items. Customers can log into their accounts to determine where their things are. They may also check when a cargo is estimated to arrive and whether there are any shipping delays (24). The same is true in reverse.As a result, businesses might employ RPA to manage incoming check calls. This saves a lot of money and helps with proactive planning. For example, the client can arrange to be there for deliveries that require a signature or goods that should not be left unattended. RPA in transportation is changing the game in real time. Companies can use this technology to automate the ability to read and respond to customers and vendors. Businesses may then use IVR or email exchanges to update system information, allowing more efficient and accurate product distribution.Everyone in the supply chain benefits from automatic tracking. It improves visibility of shipment and delivery status. Similarly, it does not require a human to deliver the information, reducing the danger of human error. RPA also helps with disruption management. When problems arise, the system automatically modifies the procedures to accommodate for any changes. If a hard exception occurs, the system can alert the relevant parties, provide details about the problem, and suggest corrective action (25). These automated functions maximize the effectiveness of personnel. Businesses can do more with the same number of employees.

Transportation Management Using Robotic process automation (RPA)-Artificial intelligence and robotics have a wide range of potential uses in the global supply chain. Among these, supply chain automation's pivotal role in robotic process automation (RPA) is what drives the industry's progress towards efficiency and productivity targets. Because it can be used to practically any task, RPA in transportation management is comparable to deploying a smart assistant on a worldwide platform (26). In fact, supply chain leaders and logistics service providers must understand the top three ways RPA may have the greatest impact. True Exception-Based Administration Is Made Possible by RPA in Transportation Management- RPA in transportation management is based on a straightforward idea: it imitates actions based on historical and current data to replicate human motions while utilising a supply chain management platform. According to Carrie White of Freight Waves, it is "a rapidly developing technology that mimics human behaviour and has established itself in the financial services and hotel areas." Also, it has a place in logistics. Robotic process automation (RPA) is intelligent automation software that mimics routine tasks that humans complete on a daily basis, such reading emails and quoting rates, using machine learning, natural language processing, and artificial intelligence (26). RPA technology might eventually provide every broker with an assistant to perform lower-level duties, allowing them to focus on higher-level strategies." RPA Uses Self-Optimizing Systems to Reduce Aggregate Costs- The utilisation of RPA's optimisation skills in transportation management is another possible use. Due to the fact that RPA operates independently and in the background of virtual settings, it may be used to continuously review, evaluate, and enhance systems and routes. The use of freight forecasting tools and indices, as well as getting additional information about estimated times of arrival (ETA), choosing the optimal way for a cargo, etc. are all implied by this function. White continues, "RPA may be viewed as a tool for labour optimization as opposed to workforce replacement (27). All of this reduces the overall landing cost of freight management and transportation. The usefulness and application of RPA in transportation management will only expand in the modern supply chain. As the global supply chain approaches complete automation and maximum optimization, the ability to use RPA in transportation will become an even more important competitive difference. To be ready, enterprises must first deploy a complete transportation management platform, such as the MercuryGate platform (28).

How Navigation and Robotic Process Automation help in transportation Transportation System The shift toward automated system development in recent years has resulted in a significant change in the working process. Many technological challenges must be addressed, including localization, to ensure a successful navigation system. Create a new intelligent transportation system based on robotics and navigation. Robotic process automation offers transportation systems with the ability to manage orders that involve the start of transport (29). Transportation finished, as well as an issue with transportation to incorrect places on the paths. In robotic process automation, navigation systems must solve a number of issues, including as mapping, localization, path planning, elevators, and communication systems. The mapping and localization technique will be presented in this section. We'll talk about the lift component and the path planning process. Last but not least, it will be explained how the system fits into the broader automated mobile transportation system (30).Mapping- Certain characteristics are necessary in a multi-story transportation system, including rapid speed, simple coverage of a large area, cheap prices, and minimal susceptibility to light impacts (31). This includes an infrared camera, a collection of infrared LED projections on internal flash memory, a digital image memory, and a digital image processing board.Localization- Localization is considered a critical factor in robotic automation. It is defined as estimating absolute or relative location data. In life science automation laboratories, a simple and efficient localization approach is necessary (32). The necessity to build a new localization approach arose after constructing the relative map to localize the mobile in the robot in a multi-floor environment, while the previous system relied only on SGM in mapping and localization. Route Planning- Planning a route is a crucial component of creating a navigation system that works. Path planning is a motion control that takes the shortest route between a starting point and a destination while avoiding collisions. For mobile robotic transportation systems, path planning problems provide more hurdles than those faced by conventional systems, and real-time planning results are sought (33).Nevertheless, due to the wide variety of beginning places and destinations for transportation, the projected path palming technique should be able to combine the dynamic path combination quickly and adaptably. For the objectives of the study, a new route design strategy is proposed, consisting of a collection of flexible sub-pathways for every laboratory station and one important path for each level(34). Using the designated backbone technology, the associated internal transportation management system (ITMS) software has also been created.Mechanisms for internal transportation: The MFS transportation management system is called ITMS. In order to increase efficiency and the capability to access the MFS at any moment, it was created utilising a multiple thread technique. The management system breaks down the arriving transportation jobs into smaller assignments and continuously executes them. Also, it updates the robot remote centre (RRC) on the status of the present transportation, including the commencement of the transportation, any faults or mistakes, the parameters for the path, and the completion of the transportation (35). How navigation and Robotic Process Automation increase productivity and efficiency in transportation sector-RPA is being used by businesses to simplify numerous business processes to increase operational efficiency. Using RPA bots to tackle "busy work" increases the productivity of your own personnel. According to studies, these bots operate two to five times faster than people, 24 hours a day, seven days a week, with an 80% decrease in errors. The navigation system is critical to effective fleet management and monitoring(36). The innovative and versatile technology employs the Global Positioning System (GPS) to optimise fleet operations by offering real-time updates, optimum route selection, fleet maintenance, fuel management, and other services.The most significant benefit of robotic process automation is that it frees up your personnel to focus on activities that demand their valued ideas and creativity (37). The end result for your company will be more engaged staff. Employee morale and retention rates improve significantly as a result.Save time and money-Process massive amounts of work more quickly, effectively, and precisely, resulting in reduced processing time and resource costs.Robotic Process Automation Saves a significant amount of time and human labor. Save time and is also cost-effective. Platform independence, scalability, and intelligence are important characteristics of robotic process automation (38). Navigation system [provide accurate information and direction for the work, which can lead to better efficiency and save time and money.Tracking in Real Time Tracking software should be able to track in real time. To stay ahead of the game, you may analyze the vehicle's position and behavior. As a result, the information can also be used to retrieve information. Passengers and departments can get real-time tracking information and vehicle current position and arriving time (39). Optimization of Routes-Analyzing traffic data to determine optimal fleet routes may help organizations make educated decisions. This feature can help to decrease delays and increase customer satisfaction.Transport route optimization is increasingly required for logistics organisations seeking to boost productivity. Many transportation companies are converting to the usage of route optimization software. Their goal is to simplify activity management to save time for their staff. One of the benefits is the reduction in transportation expenses (40). This can only be accomplished using industry-specific tools. Discover the advantages of improving transportation routes.Monitoring of Driver Behavior-Tracking and monitoring undesirable driving habits such as forceful braking, speeding, inattentive driving, and so on can help to remove them. Furthermore, assessing the behavior of AI, Dash cam, and other technologies might help drivers improve their performance proactively (41).Customized Notifications-It is regarded as a must-have element in vehicle monitoring systems in order to monitor activities such as high idle hours, fuel waste, when repair is necessary, and so on. Most significantly, warnings and notifications improve our fleet's management and visibility.

Benefits of using navigation and robotic process automation Improved route planning- Tracking via navigation and automation may also assist in identifying the best and worst roads by examining information from previous excursions using the position history map. Using location-based historical data, fleet managers may improve routes by recognising congested roadways (42). Route optimization can immediately improve driver efficiency and productivity.Prevent the usage of unlicensed vehicles- Fleet managers can easily discover whether the vehicle is being exploited or is being used for side employment, operational usage by using the current location through GPS tracking, and position history information. Unauthorized vehicle usage is impossible if a navigation system is installed in the vehicle and the general position of the vehicle can be tracked.Administrative load has been reduced- Fleet managers may lessen their administrative burden by doing away with manual bookkeeping and fewer calls to drivers thanks to real-time tracking. A fleet administrator may obtain real-time position information from his handlers by simply glancing at his fleet management dashboard whenever he wishes(43).Real-time automated alerts-Vehicle tracking can follow cars in real time, and fleet managers can set up geofenced notifications whenever a vehicle arrives and leaves a job site. When the transportation department is not required to manually track their vehicles, they can organize their operations and daily activities more efficiently in the transportation industry. Administration workload may be reduced by being aware of the positions of all of their cars and getting alerts when they arrive or leave key sites (44). It is a major benefit of Global Positioning System (GPS) tracking, for example, to be able to notify consumers if there is a delay. Similarly, fleet managers can use geofenced alerts to warn shippers or receivers when drivers are due to arrive at a location. Early alerts can help accelerate operations, increase productivity, and reduce detention time. Improved client service: Vehicle monitoring and current location information can also help develop client service and achieve a competitive edge. When the transport department knows exactly how far the vehicle is from its location, it can provide accurate information to its consumers with realistic expected arrival times. Employer and employee satisfaction through Robotic Process automation Increased productivity and competitiveness are a result of automation When applied correctly, the automation of robotic processes can help the transportation sector become or remain competitive(45). Automation also allows huge organizations to increase their competition by enabling faster product growth and distribution. Expanded bot work can also help firms in high-priced nations reshore or bring back to their home base supply chain segments that were previously contracted to lower-wage countries (46). At the moment, the biggest risk to employment is not automation but rather a lack of ability to compete. Enhanced productivity: automation can help streamline those daily procedures, eliminate mistakes, and free up more time to focus on the business's key concerns. It can even create new higher-skilled employment types that provide more value to customer relationships and business development. These may be found most successfully in new lead generation and sales jobs, as well as planning ahead for peak demand, planning and execution, demand modeling, dispute resolution, and other areas. Overall,automation has increased labor demand and has a favorable influence on salaries(47). Robotics is increasing the demand for people at the higher end of the skill spectrum, which is gaining in income. The issue is to establish ways to allow lower and middle-income earners to use up skills or retrain. Automation's impact on jobs and pay- Robotic automation has made significant progress in recent years, with an increasing number of applications in industrial processes, leading to increased productivity and employee happiness. For a long time, robotics and artificial intelligence have existed as separate scientific and technical domains, and only recently have they merged and crossed-fertilized (48).Effects of automation on work satisfaction: Job satisfaction is a measure of an employee's subjective well-being (i.e., their own assessment of the well-being they experience at work). Clearly, this is an important aspect for economic research and policy. First, as people spend a considerable amount of their life at work, job satisfaction is a key factor in determining an individual's overall subjective well-being. Second, those that are unhappy and dissatisfied with their jobs frequently exert less effort and are less motivated, which results in higher turnover rates. As a result, the productivity and innovation of the economy suffer (49).Individual-level information and knowledge-Employees may improve their knowledge and information about technology by using automation, which can raise their job efficiency and technological updating in their field. This may result in their self-satisfaction(50).

Review of Literature

Pansambal, Suvarna et al. (2016), "Literature Review: Navigation Systems for Fastest Route" examine in their study A quick overview of the many transportation applications accessible in Mumbai. We can see that to obtain all the required information, more than one application must be used. The applications are largely mobile-based and cannot be accessed with a web browser. **Tailor, R K et al. (2021),** 'Application of robotic process automation in the unorganized sector observed in their paper on the adoption system of RPA due to the lack of information on the deployment of RPA in unorganized industries. If the unorganized sector can use robotic process automation, data transparency and data analysis will be much more efficient, which would be highly convenient for end-users and unorganised sector owners.

Chaitali K, Lakde et al.(2015), "Review Paper on Navigation System for Visually Impaired People' observed in their paper an overview of the cutting-edge approaches used in navigation systems for visually impaired people. It indicates that navigation systems have not been widely used, owing mostly to prohibitively high costs, inaccuracy, and usability. **Tailor, R K et al (2020),**" Application of Robotic process Automation in Queue System of Shopping Malls In India" seen in this paper If shopping malls implement robotic process automation, their customers' waiting time will be reduced. Shopping mall management must implement robotic process automation in their payment system to reduce queuing time and increase customer satisfaction.

Allerton, David J et al. (2005),- "A Review of Multi sensory Fusion Methodologies for Aircraft Navigation Systems" seen in their paper the approaches for designing and developing safety-critical airplane navigation systems, including fault-tolerant navigation system designs, data fusion filter architectures, and accompanying filtering algorithms, have been outlined. These technologies give navigation system engineers and researchers strategies for designing and developing future aircraft multi sensory navigation systems.

Reddy, K P Naveen et al. (2019), "A Study of Robotic Process Automation Among Artificial Intelligence" detected in their paper RPA employs software and procedures capable of using cutting-edge technology like artificial intelligence, machine learning, speech recognition, and language communication processes to take automation to the next level.

Andersen, Christin Jens et al. (2011), "Autonomous Rule-Based Robot Navigation in Orchards" detected in their paper Suggests localization based on an a priory map of the three rows, as well as tree row detection using a laser scanner, which detects both the row line and the row ends. In a rule-based inference interpreter, localization is integrated with mission goals. Localization, obstacle avoidance, path planning, and drive control are all included in this rule-based mission handler.

Kumar, Shashi et al. (2020), "Robotic Process Automation" find out in their paper. This technology can be used to automate manual processes quickly and easily. It is far too advantageous to minimize mistakes and improve quality. It is critical to understand the role of Robotic Process Automation in today's world.

Soweto, Benfano et al. (2018), "A Systematic Literature Review of Indoor Position System Accuracy and Implementa- tion" examined in their article. The Global Positioning System (GPS) is a program and technology that uses satellites to guide an item. GPS can operate in any weather conditions, wherever in the globe, 24 hours a day, seven days a week, with no registration costs.

Chakraborti, Tathagata et al. (2020), "From Robotic Process Automation to Intelligent Process Automation". Exam- ined in this article with recent advances in machine learning and artificial intelligence (AI), the automation of stages in a business process, called Robotic Process Automation (RPA) – is experiencing a drastic revolution.

Lee, Pan-Mook et al. (2008), "Review on Underwater Navigation System Based on Range Measurements from One Reference" Range measurements can be used to correct for growing inaccuracies in location estimations caused by inertial sensor-based navigation systems. The range measurements have the potential to reduce the cost and complexity of underwater navigation devices while also saving payload space in the vehicles.

Mulla, Afshan et al. (2015), "GPS Assisted Standard Positioning Service for Navigation and Tracking: Review Implementation" stated in their paper. The basic architecture of GPS segments, namely the Space segment and the Control segment, is described. To follow objects on Earth efficiently, the satellites in the constellation must perform various activities like C/A code creation, modulation, frequency planning, and so on.

Fernandes, Hugo et al. (2012), "A review of assisted spatial orientation and navigation technologies for the visually impaired" Extensive research has been committed to developing assistive solutions to overcome or decrease the obstacles presented by vision impairment. The need for assistive technologies has long been a constant in the daily lives of people with visual impairment, and it will continue to be so in the future. **Paul, Liam et al. (2014),** "AUV Navigation and Localization: A review" seen in their article There should be a separation between navigation and localization. The precision with which the AUV steers itself from one location to another is called navigational accuracy. The mistake in the success of the AUV's location on a map is called localization accuracy.

Descriptive Study For the critical evaluation of the performance of the transportation sector, a personal discussion and interview has been conducted in the transportation sector. The result has been categorized as follows:

0.1 Rank analysis of RPA benefits at Transportation Sector

The rank analysis of RPA benefits for the transportation sector is explained in the following table.

Factors	Weighted Mean	Rank
Operational Cost	27.95	8TH
Security Efficiency	62.63	1ST
Security Arrangement	20.52	10TH
Evaluation of Skills	56.23	3RD
Grievance Redressal Mechanism	43.04	6TH
Generation of HR Policies	46.32	4TH
Customer Satisfaction	25.34	9TH
Work life Balance	44.30	5 TH
Salary and Perks	35.44	7TH
Employee Satisfaction	65.50	2ND

Table 1. Rank Analysis of RPA at Transportation Sector

Inference Drawn: Based on the above analysis, it can be drawn that the efficiency and satisfaction of working among employees are the highest after the implementation of the RPA in the transportation sector. **Rank Analysis of Impact of Navigation on the performance of Transportation Sector** The following table shows the ranking analysis of the impact of navigation on the performance of the transportation sector.

Inference Drawn: (Table3) It is clear from the above table that the management of the transportation sector can control and evaluate the performance of their staff with the help of proper navigation. Management can focus on improving performance and efficiency, along with cost management and resource allocation at a particular time.

S.NO, Factors, Weighted Mean and Rank			
1. Effective Time Management 82.57	3RD		
2. Evaluation of Employees and 79.45	2ND		
3.	Motivation of Commitment	87.56	4TH
4. Reduce Nonattendance	75.58	1ST	

Table 2. Rank Analysis of Impact of Navigation on the Performance of the Transportation Sector

Statistical analysis For statistical analysis, the independent t test has been applied to evaluate the performance of before and after RPA and navigation, which is shown as follows:

Independent t Test: An independent t test has been performed to compare the performance of the transportation sector before and after the application of RPA and navigation. Hypothesis testing has been carried out using an independent t test to compare the performance of RPA and navigation based on the given dimensions of the performance evaluation of the transportation sector. A detailed analysis of the t test is shown in the following table.

Group Statistic					
		N	Mean	Standard Deviation	Std. Error Mean
Awareness	1.00	158	3.54	0.6	.048
	2.00	87	3.47	0.4	.045
Satisfaction	1.00	158	3.18	0.7	.056
	2.00	87	3.12	0.6	.060
Adoption	1.00	158	1.51	0.1	.010
	2.00	87	1.64	0.1	.014
Future Growth	1.00	158	1.92	0.6	.051
	2.00	87	1.84	0.6	.066

Table 3. Group Statistics

Inference Drawn: The above table shows the group statistics, which describe the mean difference, the standard deviation difference, and the standard error of the difference. Based on the above table, it can be concluded that there is a difference in the mean and standard deviation between before and after the implementation of RPA and navigation.

Inference Drawn: An independent t-test is used to compare the before and after performance parameters of the transportation sector before and after the implementation of RPA and navigation. The performance of the transportation sector can be increased after the implementation of RPA and navigation. The major factors have been identified and focused on so that, after the implementation of RPA and navigation, the overall performance can be improved.

Conclusion The performance evaluation of the transportation sector is a problem these days as the role of technology has increased. A proper evaluation and measurement of performance can only be evaluated if a proper evaluation and evaluation can be made. The RPA and navigation, which are essential in transportation, may improve the performance of employees and resources and also increase satisfaction among staff and their customers. Semi- or fully-autonomous navigation may become possible as a result of robotic process automation in transportation. In semi-autonomous mode, the system responds to typical motion directions through voice activation or a traditional joystick interface and enables robotic motions that avoid obstacles and collisions. While the results of the trials of the completely autonomous mode are quite promising, the sparsest or semi-automated navigation option is also viable. Robotic process automation has several benefits, including cost savings, improved quality, and enhanced satisfaction for customers. (RPA).Robotic process automation (RPA) is a technology application that automates business processes by employing business logic and structured input. Businesses may use RPA to create software, or a "robot," that can record and comprehend processes including transaction processing, data modification, reaction activation, and system integration. Robotic process automation (RPA) allows companies to automate repetitive rules-based business processes, allowing employees to focus on more important tasks like customer care. Important for the development of public transportation systems. However, the business has significant challenges at the moment. This study’s principal objectives are to evaluate robotic navigation systems’ (RNAVs’) operational and financial efficacy in the transportation sector, as well as their utility. There is a mix of primary and secondary sources in this investigation. Some of the operational and financial parameters covered in the interviews compiled here are fleet size, collection volume, and passenger counts.Like a digital telephone, a navigation system is a two-way communication system that may be used to determine your precise location and obtain up-to-date directions from a central location. Some of the components can be kept at a remote and stationary base station because of the use of a two-way communication system, and an ideal human-to-human information interface is given.

		Levene's test for equality	t-test for equality of mean						
		f	t	dt	sig. (2tailed)	mean difference	std. error difference	95% confidence interval of the difference	
								lower	upper
Awareness	Equal variances assumed	8.44	1.01	244	0.31	0.07	0.07	-0.07	0.21
	Equal variances not assumed		1.12	229	0.27	0.07	0.07	-0.06	0.20
Satisfaction	Equal variances assumed	3.13	0.67	243	0.51	0.06	0.09	-0.11	0.23
	Equal variances not assumed		0.71	21	0.48	0.06	0.08	-0.10	0.22
Adoption	Equal variances assumed	3.22	-5.10	244	00	-0.10	0.02	-0.13	-0.07
	Equal variance not assumed		-5.93	174	0.00	-0.10	0.02	-0.13	-0.07
Future Growth	Equal variance assumed	0.46	0.94	243	0.35	0.08	0.08	-0.09	0.24
	Equal variance not assumed		0.95	186	0.34	0.08	0.08	-0.08	0.24

Table 4. Independent Sample Test

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