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Mee Band: AI-Powered Object Location Assistant

Mr. Udeesh Pratik Bhoot

Student, 9th Grade, Jayshree Periwal International School

Abstract

1. The problem

- Forgetting where we left our belongings is a common problem.
- It can cause frustration and irritation, especially when we are in a hurry or have many things to remember.

2. What previous research shows

- Research on wearable technology shows that motion sensors can collect information about human activities and recognize different movements.
- This suggests that wearable devices can help monitor everyday behaviour (Shoaib et al., 2016; Zhang et al., 2022).

3. Context-aware technology

- Research on context-aware computing shows that technology can use information about a person, their surroundings, and their activities.
- This information can help technology provide more useful and personalized responses (Dey, Abowd & Salber, 2001).

4. Our proposed solution – Mee Band

- To address this problem, we propose Mee Band, a wearable smart band designed to support people in everyday life.
- The band would use motion sensors to track hand and wrist movements throughout the day.

5. Collecting information

- The band would record information about the user's activities.
- This information would then be sent to a connected application.
- The application would store and organize the information as a digital record.

6. Finding misplaced objects

- Mee would allow users to ask questions about their previous activities.
- For example, a user could ask where they last used or detected an everyday object.
- The system would use the recorded information to provide the most relevant available answer.

7. Current stage of the research

- Mee Band is currently in the proposal and development stage.
- Therefore, further research and testing are needed to determine how accurately the system can recognize activities and provide useful information about misplaced objects.

Study: Shoaib et al. (2016) studied how wrist-worn motion sensors can recognize human activities. Using accelerometers and gyroscopes, they examined thirteen activities and found that sensor position and data-

processing window size affected recognition accuracy. This supports Mee Band's use of wrist sensors to identify everyday movements and activities.

Limitations: Mee Band may have some limitations, such as mistakes in recognizing activities, interference with Bluetooth Low Energy signals, changes in the position of the sensor, limited battery life, privacy concerns, and incorrect AI responses. Sometimes, different movements may look similar to the system and could be recognized incorrectly. To reduce this problem, the system will use machine-learning models trained using different activities and users. Bluetooth signals can also be affected by walls, furniture, distance, and other signals, so the system will use multiple readings to find the most reliable last-detected location. Battery usage can be reduced by using low-power sensors and Bluetooth Low Energy. User information will be protected through encryption and authentication to improve privacy and security. The AI will only use information that has actually been recorded by the system and will not make up an answer when reliable information is not available.

Introduction

Mee consists of a smart wearable band that is connected to an app and an AI system. The sensors in the band collect movement continuously without disturbing the user. Then this information is received by our app instantly, where it is stored and organized in a particular section. This system is developed such that it can easily recognize what the user is doing. For example, if a user forgets where they last used their calculator, they could ask the application, "Where did I last use my calculator?" The application would then search the recorded information and provide the most relevant available result.

Many bands show you health and a vast range of data. But our band is here to really solve a real-world problem. Our band doesn't just show users their health but also tells them where they have kept their lost items. Also, we will have a vast amount of data that can be stored. This is a proposed idea, and we are still working on the prototype. The main feature that differs Mee from other commonly used bands is that it doesn't just tell things related to health, but it also helps you find missing items. The user doesn't really need to take off the band, as it is resistant to most things; also, the activities can be recorded without requiring the user to manually document them. The language is simplified and is available in most of the languages, which makes people feel more comfortable with it. This could make the technology particularly useful for people experiencing memory difficulties and could reduce the frustration of repeatedly searching for misplaced belongings.

AI is necessary for this world, as we are really trying to solve the problem that everyone faces every time. Research is really important for this proposed idea because people should be aware and know what the problem really is. It will definitely make the lives of people easier. We combine different techs to see if this really affects the world. MEE demonstrates how wearable technology, motion sensing, and artificial intelligence could be combined to provide an extraordinary result. Its comfortable wearable design allows it to be used during everyday activities, while the connected application provides easy access to the information. In addition, it helps people who are challenged by memory loss and people who forget. We have all gone through it, and to solve this simple thing, the proposed system integrates wearable sensing, BLE-based object detection and an AI-enabled mobile application. However, further testing is needed to improve the accuracy of activity and object recognition. Future development could focus on improving sensor accuracy, object recognition, battery life, privacy, and the overall usability of the application.

Mechanics

Mee Band is a wearable system consisting of a wrist-worn sensing unit, a smartphone application, connected object tags, and an AI-based information system. The band uses a 6-axis IMU containing an accelerometer and gyroscope that can measure wrist acceleration and rotational movement. A low-power microcontroller processes the sensor signals and communicates with the smartphone through Bluetooth Low Energy (BLE). Objects such as keys, calculators, or glasses would use small BLE tags, allowing the system to detect their proximity and record their last known location and detection time. The application combines object information with relevant activity data and stores it in a structured database. A machine-learning model can classify predefined activities using processed sensor data, with performance evaluated through accuracy, precision, recall, and F1-score. When the user asks a natural-language question, the AI retrieves the most relevant stored record rather than guessing. The system would also include a rechargeable battery, power-management circuit, vibration/LED feedback, and a durable wearable enclosure. User data collected by Mee will be stored securely and carefully because the system may collect information about activities, objects, and locations. The data could be stored locally on the user's phone, with optional cloud storage for backup if required. Important data should be encrypted so that it cannot be easily accessed by unauthorized people. Only the user and authorised parts of the Mee system should have access to the stored information. Data should only be retained for as long as it is useful, and users should have the option to delete their information whenever they want. Location information should receive additional protection because it can reveal where a user has been. Password protection, authentication, and access controls would be used to reduce unauthorized access. Continuous monitoring may create privacy risks, so users should be clearly informed about what is being collected and given control over their data.

Methods

Wearable tech can be used everywhere and every day and can be part of people's lives. It collects information and works for us to make our lives better. We will also see if it works effectively. Research has shown that wrist-worn devices and smartphones can be used to recognize activities such as walking, running, sitting, and standing by analysing data collected from motion sensors. One study combining a wristband with smartphone sensors achieved an average activity-recognition accuracy of 87% ± 5%, demonstrating the potential of wearable and mobile devices to monitor everyday activities in real time. However, in today's world, most wristbands track physical fitness and exercise, which leaves a lot of room to develop something new using wristbands. The band would contain motion sensors, such as an accelerometer and gyroscope, which could continuously collect information about the user's movements. This information would be transmitted to a connected smartphone application, where it could be processed and stored forever. Previous research has mentioned that smartphone and wearable sensors can work together to identify physical activities, while research into smartphone-based activity recognition has shown that built-in sensors can provide continuous measurements of everyday behaviour.

Mee extended this idea to bring both of them together to make something new. A major feature that is proposed for Mee is an object-location system that could help users remember where they last placed commonly used objects, such as a phone, calculator, keys, or other connected items. When an object is detected by the system, the application could record information about its last known location and the user's recent activity. For example, if a user placed a connected calculator on a desk and later moved to another room, the application could use the recorded information to answer a question such as where the calculator was last detected. This approach is related to research on context-aware sensing, in which sensor information is used to determine a device's location or the user's activity. Studies have shown that

smartphone position can affect sensor readings and that combining sensor information with activity recognition can improve contextual understanding. To put it in another way, say a person forgot where he/she kept the specs; the sensor data can judge when and where it was the last time hands went to the position of the eyes and came down, analysing the place where the specs were last left by the user.

Research aim

This research aims to investigate the feasibility and effectiveness of Mee, a proposed wearable technology system that combines a wrist-worn motion-sensing band, a smartphone application, Bluetooth Low Energy (BLE), and artificial intelligence (AI) to help users locate misplaced everyday objects. Unlike wearable devices that mainly focus on health and physical-activity monitoring, Mee is designed to create a continuous digital record of relevant user activities and object detections. Previous research has demonstrated that accelerometers and gyroscopes can be used for human activity recognition (HAR), while BLE-based technologies can support indoor positioning and proximity detection. However, the proposed research focuses on investigating whether these technologies can be integrated into a single context-aware system for everyday object-location assistance.

The first objective of the research is to evaluate the activity-recognition capability of the Mee band using data collected from its accelerometer and gyroscope. The study will investigate whether the system can distinguish between predefined everyday activities and movements that are relevant to object use. Sensor data will be divided into appropriate time windows, processed to reduce noise, and analysed using a machine-learning model. The performance of the activity-recognition component will be evaluated using measurable indicators including accuracy, precision, recall, and F1-score. The research will also investigate whether different sensor-window sizes and sensor placements affect recognition performance, as previous research has identified these factors as important considerations in wearable activity recognition (Shoaib et al., 2016; Zhang et al., 2022). The second objective is to evaluate the accuracy and reliability of object-location detection. BLE or another appropriate location-detection mechanism will be used to record the last known location and detection time of compatible objects. Testing will be conducted across different indoor environments, distances, and conditions to determine how environmental factors such as walls, furniture, distance, and signal interference influence location estimates.

The third objective is to investigate the effectiveness of integrating activity recognition, object-location information, and an AI-based question-answering interface. The study will assess whether the application can correctly retrieve stored information and provide an appropriate response when users ask natural-language questions about misplaced objects. This will involve comparing the information requested by the user with the information stored by the system and determining whether the response correctly identifies the most recent relevant object detection and associated activity. A further objective is to evaluate the practical feasibility and usability of the proposed system, including the reliability of communication between the wearable band and smartphone application, the organisation of recorded information, and the clarity of the AI-generated responses. These objectives establish a direct connection between the research aim, methodology, testing procedure, and expected outcomes. Overall, the research will determine whether combining wearable activity recognition with indoor object-location detection can provide a practical and reliable approach to helping users locate misplaced belongings.

The Mee system would consist of three main components: the wearable band, a smartphone application, and connected objects or location-detection mechanisms. The band would collect movement and activity data, while the app would store and organize the data received by it. An artificial intelligence component

could allow the user to ask natural-language questions about the recorded information present in the app. Instead of manually searching through stored data, the user can simply ask the AI where a particular object was last detected and what possible locations may be relevant. This would make the system more interactive than a normal activity tracker. The combination of wearable sensing, machine learning, BLE-based indoor positioning, context-aware computing, and AI-assisted information retrieval is intended to create a practical system for everyday object-location assistance. However, the accuracy of the proposed system would depend on factors such as sensor quality, activity-recognition performance, object-detection methods, Bluetooth connectivity, environmental conditions, and device placement. Further research and experimental testing will therefore be required to determine the reliability and effectiveness of Mee in real-world environments.

places of it might be present. This would make the system more interactive than a normal activity tracker. However, accuracy would depend on factors such as sensor quality, object-detection methods, Bluetooth connectivity, and the position of the devices. Research has shown that the location of a smartphone can influence activity-recognition accuracy, demonstrating the importance of considering device placement when designing such systems.

Results

The purpose of this research is therefore to investigate whether a wearable system such as Mee could combine activity tracking, contextual information, and intelligent object-location assistance into a single platform. This band could provide a more practical use of wearable technology by helping users understand not only what they have been doing but also where their frequently used objects were last detected. Future development and testing would be required to evaluate the accuracy of activity recognition, object-location detection, Bluetooth communication, data storage, and natural-language responses. Privacy and responsible handling of personal activity data would also need to be considered because wearable systems can continuously collect information about users and their daily behaviour.

Wearable tech is developing rapidly, and brands are continuously advancing sensors and the tech. Wearable sensors can continuously collect information about movement and physical activity, allowing systems to recognize activities such as walking, sitting, running, and other daily movements. As mentioned above, Reviews of wearable-sensor research have shown that accelerometers and gyroscopes are among the most commonly used sensors for activity monitoring and recognition. Human activity recognition (HAR) has also become an important research area as it records activities without the user activating it.

Mee is an advanced and proposed wearable system that is designed to combine activities done, where the object was kept, and an AI-based mobile app. Previous research has demonstrated that combining wrist-worn and smartphone motion sensors can improve the recognition of different human activities, while the position of the sensor can influence the capability of the sensor. This band uses the wrist as an important sensing location, allowing the smartphone to provide additional capabilities that can improve the model.

The wearable band would collect acceleration and rotational movement using the sensors that were previously mentioned. Sensor readings would be sampled at a fixed frequency and divided into short time windows before processing. The data would then be filtered to reduce sensor noise and converted into features describing the user's movement. A machine-learning activity-recognition model could classify these features such as walking, sitting, standing, running, and other predefined activities. Machine-learning and deep-learning approaches have previously been investigated for wearable HAR. The prototype would be tested, and the trials would be repeated for fair and accurate results. Accuracy,

precision, recall, and F1-score would be calculated from the results obtained. The testing procedure would also compare different sensor-window sizes because previous research has shown that segmentation-window length can influence activity-recognition performance.

The object-location function would use Bluetooth Low Energy (BLE) to detect compatible objects associated with frequently used items. BLE is suitable for this purpose because it is designed for low-power wireless communication and can be used for indoor positioning and proximity detection. When an object is detected, the application would record its place, time of detection, and relevant activities. The app could therefore maintain a history such as "calculator detected near the study desk at 16:20." When the user asks the application where an object was last detected, the AI would find the answer to the question from the stored records and provide the most recent reliable information. Indoor BLE positioning can be affected by signal fluctuations, reflections, obstacles, and interference, so the prototype would be tested in different environmental conditions to make sure the proper functioning of the product.

Because Mee is currently a proposed product rather than a completed experimental system, the results mentioned here show the expected outcomes rather than perfect and tested information. Existing research indicates that wearable sensors can successfully support physical-activity recognition, although performance depends on sensor placement, activity type, data quality, and the recognition algorithm. Research has also shown that combining information from different sensor positions can improve recognition compared with relying on a single position. Recent reviews have reported that advanced BLE localization methods can achieve sub-metre accuracy in some experimental conditions, while indoor obstacles and signal interference remain important limitations. Therefore, Mee should report object locations as approximate or last-detected locations rather than presenting positions that are not calculated or seen.

Discussion

The Mee band consists of two things that are studied deeply: wearable activity recognition and context-aware object-location assistance. Context-aware computing seeks to interpret information from a person's situation, environment, and interactions, and use it to produce better responses. Mee does this by applying information about the user's movement, connected objects, and time to a searchable index of daily experiences. Instead of being a generic activity tracker, Mee could be used as an intelligent personal assistant by letting users formulate questions in natural language and receive answers based on recent observations. However, there are several potential technical challenges that need to be addressed for the system to be successful. Activity recognition can be imprecise due to variations in individual physiology and sensor placement, while BLE location tracking can have issues with walls, distance, reflections, and other obstacles. Meanwhile, the constant tracking of activities and other objects presents potential privacy and data management concerns. The Mee project needs further research and development to turn this theoretical overview into working software and hardware. Future work could include developing a physical prototype, collecting a comprehensive data set, training the recognition model, testing BLE precision in realistic conditions, and evaluating the effectiveness of the AI-driven personal assistant interface. If these steps are done, we will be ready to implement this idea in real life and will make it globally available.

Previous research has stated that accelerometers and other wearable sensors can be used to monitor physical activity and recognize different human behaviours. Machine learning and deep learning are applied in this system because it easily sense difficult things while others cannot. These findings support

the proposed use of an accelerometer and gyroscope in the Mee band. Shoaib et al. (2016) demonstrated that sensor position and segmentation-window size can influence recognition performance; actions that are repeated very much are easy to detect, but the actions that are repeated very little are difficult. Therefore, Mee would need to be trained and evaluated.

The object-location feature of Mee is based on previous research into indoor positioning. GPS is not very reliable indoors because signals can become weak due to buildings and other obstacles. Because of this, technologies such as Bluetooth Low Energy (BLE) can be used instead for indoor positioning and detecting nearby objects. Morgan (2024) found that some BLE systems can achieve accuracy of less than one metre, although very high accuracy is still difficult to achieve. Surian et al. (2019) also showed that BLE beacons can be used to track people indoors, but the accuracy can change depending on the surroundings and signal interference. Based on this research, Mee could use BLE to identify the last area where an object was detected. However, the app should say that the location is approximate rather than claiming that it is always exact.

One thing that makes Mee different from many activity-tracking systems is that it combines information about the user's activities with information about their objects in day-to-day life. It can be designed as a low-cost, budget-friendly product that can be utilised at a large scale by common people. But again, it will take a lot of designs and redesigns to make it pocket-friendly. Mee could use this idea by keeping a record of activities, locations, and connected objects. For example, instead of only recording that a calculator was detected, the system could also record where and when it was detected. This information could then be used when the user asks the app a question such as, "Where did I leave my calculator?" Research has already shown that activity data can be processed using mobile devices while the user is carrying out normal activities. This makes Mee a more advanced and better wearable tech.

Some limitations need to be considered. The sensors on the wrist can make errors, as some movements can be similar to other movements that the sensor cannot detect or detects incorrectly. BLE can also be affected by walls, furniture, distance, and other signals in the environment. It can also misjudge a movement due to touch or physical influence from another person in the vicinity. Another important issue is privacy because Mee would collect information about a user's activities and the locations of their objects. The data would therefore need to be stored securely, and users should have control over what information is collected. Kristoffersson and Lindén (2022) also pointed out that results from controlled experiments do not always represent what happens in real-life situations. Future research on Mee should therefore test the system in normal environments, such as homes, classrooms, and other indoor spaces. The tests should include different rooms, distances, and everyday activities to see how well the system works in real situations.

Conclusion

Mee Band is a proposed wearable system that combines wrist-based motion sensing, Bluetooth Low Energy (BLE), a smartphone application, and artificial intelligence to help users keep track of their everyday activities and the last detected locations of connected objects. The research addresses a gap between traditional wearable devices, which mainly focus on health and fitness, and systems designed to provide contextual assistance with misplaced belongings. Existing research supports the use of wearable sensors for activity recognition and BLE for indoor positioning, providing a basis for the proposed system. However, the current work mainly establishes the design and feasibility of Mee rather than proving its effectiveness. A working prototype still needs to be developed and tested to measure activity-recognition

accuracy, BLE location reliability, AI response accuracy, battery performance, usability, and privacy. Future research should test Mee in different indoor environments and with different users and everyday activities to determine whether combining these technologies can provide reliable and practical assistance for locating misplaced belongings.

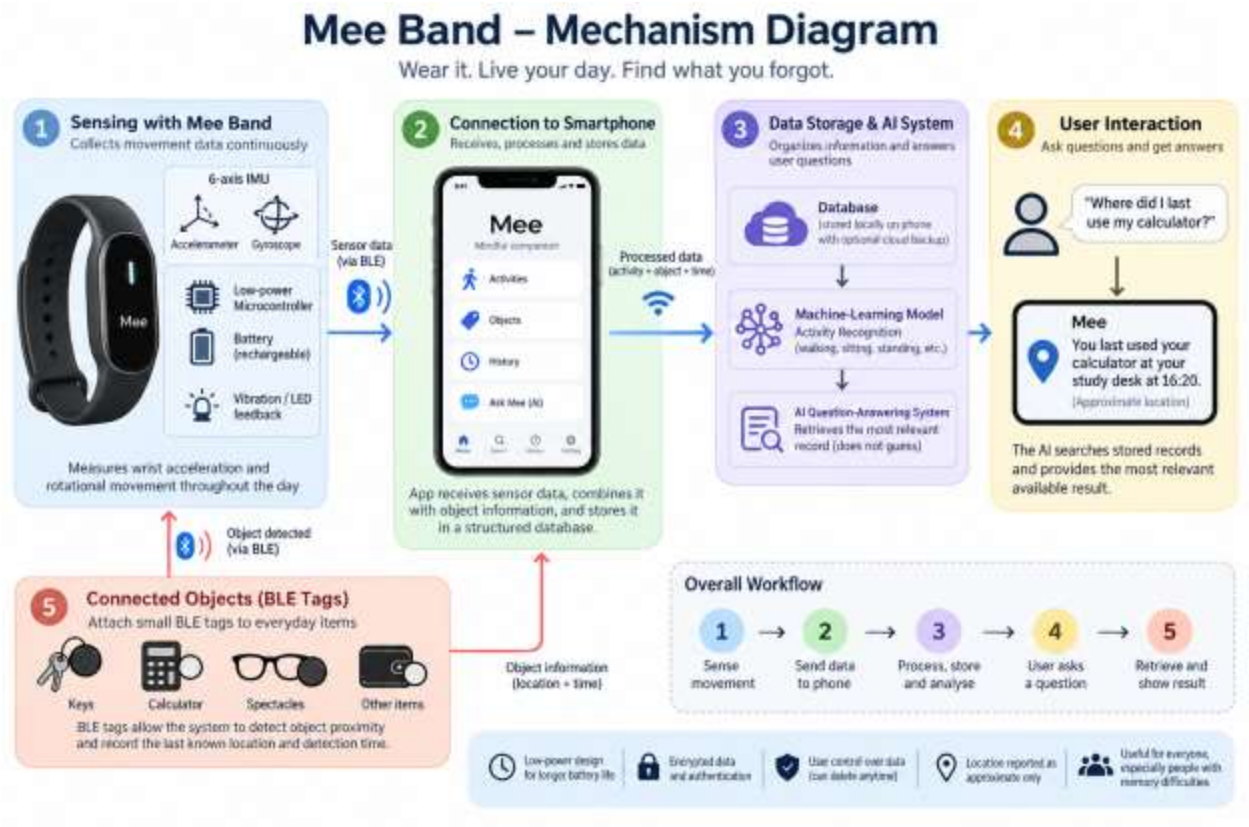
Study	Technology	Key Finding	Limitation	Relevance to Me
Shoaib et al.	Wrist sensors	Activity recognition	Sensor position affects accuracy	Supports wrist-based sensing
Surian et al.	BLE	Indoor tracking possible	Environmental interference	Supports BLE component
Zhang et al.	Wearable/deep learning	HAR applications	Recognition challenges	Supports ML component

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Keywords used
Wearable technology, Wearable sensing, Motion sensing, Human Activity Recognition (HAR), Activity recognition, Accelerometer, Gyroscope, Machine learning, Artificial intelligence (AI), AI-based question answering, Natural-language questions, Object detection

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