e-ISSN: 3031-6391
p-ISSN: 3026-0140

Content lists available at Indonesia Academia Research Society

International Journal of Industrial Engineering, Technology & Operations Management

Journal homepage: ejournals.indoacademia-society.com/ijietom

Original Article

Check for updates

Smart Wakeup: Revolutionizing Morning Alarms for the Modern Generation

Ashwin Ashwin [a,*] and Vijayalaxmi Vijayalaxmi [a]

[a] Manipal University Jaipur, Tiger Circle Road, Madhav Nagar, Manipal, 576104 Karnataka, India.
***** Correspondence: ashwin.h1@learner.manipal.edu

Article History
Received 18 February 2024
Revised 6 May 2024
Accepted 27 May 2024
Available Online 30 June 2024

Keywords:
Smart alarm
Android studio
Application
Development

Abstract

Developing an Android-based application for an alarm clock using the Android Studio IDE introduces a unique approach to addressing common issues with waking up on time. The primary feature of this application is designed to require users to physically move and walk a few steps to deactivate the ringing alarm. This functionality forces users to wake up fully, preventing them from repeatedly snoozing at the alarm and falling back asleep. The application is specifically tailored to assist students in maintaining a disciplined morning routine. Encouraging users to get out of bed promptly helps them prepare for their day, attend morning classes on time, and avoid skipping breakfast, essential for energy and focus throughout the day. In addition to its benefits for students, the application is equally valuable for working professionals who struggle with the habit of snoozing alarms repeatedly. It aims to instill a sense of punctuality and ensure they begin their day on schedule, contributing to better time management and productivity. This innovative solution addresses a widespread challenge by combining technology with behavioral motivation. It promotes healthier habits and ensures users start their day with momentum, making it a practical tool for anyone looking to improve their morning routine. With its user-friendly interface and purposeful design, the Android-based alarm clock application is poised to offer a reliable and engaging solution to an everyday problem, empowering individuals to take charge of their mornings effectively.

Copyright: © 2024 by the authors. Submitted for possible open-access publication under the terms and conditions of the Creative Commons Attribution (CC BY 4.0) license (https://creativecommons.org/licenses/by/4.0/).

1. Introduction

In earlier times, people relied on natural cues, such as the rooster's crowing, to wake up in the morning. These organic methods were effective for communities that lived in close harmony with nature and followed a more predictable daily schedule. However, as societies advanced and schedules became more structured, the need for a reliable waking mechanism led to the invention of physical alarm clocks.

Physical alarm clocks revolutionized how people managed their mornings by providing a consistent and dependable method for waking up. These devices became a staple in households for decades. However, with the advent of digital technology, traditional alarm clocks gradually gave way to smartphone alarms. Today, most people rely on the convenience of smartphone alarms for their daily routines.

Smartphone alarms offer portability and flexibility but also have significant drawbacks. The most notable issue is the inclusion of a snooze button, which allows users to delay waking up by silencing the alarm temporarily. This seemingly harmless feature often leads to oversleeping, disrupting the user's schedule and creating a cascade of negative effects. Studies, such as those by Mattingly et al. (2022), highlight how this snooze functionality contributes to poor morning habits.

Oversleeping due to snoozing has various repercussions, including missing breakfast, considered the day's most important meal. For students, it may result in arriving late to classes or missing early lectures entirely. Working professionals, on the other hand, might find themselves late for important meetings or struggling to adhere to their schedules. These repeated disruptions impact productivity and contribute to long-term stress and inefficiency.

This challenge inspired the development of a specialized alarm app designed to address the limitations of traditional smartphone alarms. The app

introduces innovative features to ensure users wake up on time and remain awake. Unlike conventional alarms, this app requires users to physically move around and take several steps before the alarm turns off. This approach encourages physical activity immediately upon waking, helping users shake off grogginess and start their day effectively.

While the movement-based feature is effective, it may not completely ensure wakefulness for all users. Sometimes, individuals might walk the required steps but still not feel fully alert. An additional layer of engagement has been integrated into the app to address this. A quiz feature compels users to answer a series of questions before the alarm can be turned off. This mental stimulation, as supported by Abood et al. (2016), activates cognitive functions and ensures the user is fully awake.

The combination of physical movement and cognitive engagement is designed to combat the common problem of drowsiness upon waking. By incorporating these elements, the app ensures that users do not simply perform mechanical actions to silence the alarm but are genuinely ready to start their day. This dual approach significantly reduces the likelihood of falling back asleep after the alarm is turned off.

Furthermore, the app is tailored to address the needs of diverse users. Students who often struggle with irregular sleep patterns and early classes can benefit from the app's ability to promote punctuality and better morning routines. Similarly, professionals who juggle tight schedules and demanding workloads can rely on the app to maintain consistency in their daily routines.

The app also offers the potential for further enhancements to improve user experience. Future updates could include motivational features, such as inspiring quotes or positive affirmations, to help users start their day optimistically. Additionally, the app could integrate with voice assistants like Google Assistant to summarize weather conditions, daily tasks, and calendar reminders immediately after the alarm is turned off (Vishnu et al., 2018).

Incorporating such features would transform the app from a simple alarm into a comprehensive morning assistant. The app could become an indispensable tool for fostering productivity and maintaining a structured routine by aligning with the user's daily needs.

The development of this app represents a step forward in addressing a common yet often overlooked problem. By combining technological innovation with practical functionality, it seeks to redefine how people wake up and approach their mornings.

Thus, the evolution from natural waking methods to advanced alarm systems reflects humanity’s ongoing quest to optimize daily life. With its unique features and growth potential, this app offers a practical solution to the challenges posed by modern alarm systems, ultimately aiming to improve users' mornings and overall well-being.

2. Materials and Methods

2.1. Language description

Java was used to develop the Android application - Smart Alarm (Salman et al., 2019). Java is a platform-independent language (Factor et al., 2006). It is used for general-purpose coding as well as Android App Development (Jana, 2014). It is class-based and object-oriented programming whose syntax is influenced by C++. The primary goal of Java is to be simple, object-oriented, robust, secure, and high-level. The code written in Java on one machine can be executed on any machine (Sarkar et al., 2019). The Android platform allows developers to write managed code using Java to manage and control the Android device. Android applications can be developed using the Java programming language and the Android SDK (Kocakoyun, 2017). Using Java, powerful and efficient applications can be created for mobile phones, remote processors, microcontrollers, wireless modules, sensors, gateways, consumer products, and practically any other electronic device (Page, 2014).

2.2. Working and Flowchart

The main intention of this application is to make the user wake up on time in the morning. The app is very user-friendly (Ramacciati et al., 2021). Upon opening the app, there is a time picker to help the user set the time for the alarm. Analog or digital-themed time pickers can be used depending on the user's interest. After setting the time, the user must press the toggle button to turn on the alarm. In the morning, when it is time, the alarm starts to ring. There is neither a button to snooze the alarm nor to turn it off. The only method to turn it off is to get up and walk a few steps. An accelerometer and step counter have been used to detect the motion (Mladenov & Mock, 2009).

In some cases, simply making the user walk a few steps may not be sufficient. Therefore, the user must also solve a few quiz questions. The alarm will only turn off once both actions are completed. This application is designed to ensure the user fully wakes up and is ready to start their day, rather than allowing them to turn off the alarm and return to sleep simply. By requiring the user to walk and solve quiz questions, the app encourages the user to be more alert and engaged upon waking up.

Once the user turns off the alarm, the app can also send a message to their friends or parents, informing them that the user is awake. The flowchart for this application would begin with the user opening the app and setting the alarm time. When the alarm goes off, the app detects the user's motion and prompts them to complete the quiz, and the alarm is only turned off when

both actions are fulfilled. The application offers various features to ensure the user wakes up on time and is fully alert. To evaluate the effectiveness of the application, user testing can be conducted with a group of university students to gather feedback on the user experience, ease of use, and overall satisfaction. Mobile alarm clock applications have become increasingly prevalent among university students, particularly in managing their sleep patterns and daily routines.

Several factors should be considered further to assess the efficacy of this wakeup task-based alarm app. These include the user's satisfaction with the app's features, the impact on their sleep patterns and overall well-being, and the feasibility of its implementation in a university setting. Specifically, a study could be designed to evaluate the app's effectiveness in improving university students' sleep habits and academic performance (Kasim et al., 2016; Lowry et al., 1951; Oh et al., 2020; Thomas et al., 2014). The product functions are as below.

1. Setting time: The user can set any time for his/her alarm from the most comfortable time-picking option, i.e., analog or digital.
2. Answering quiz: Once the alarm rings, the user needs to walk a few steps. Then, he must answer a few questions to turn off the alarm.

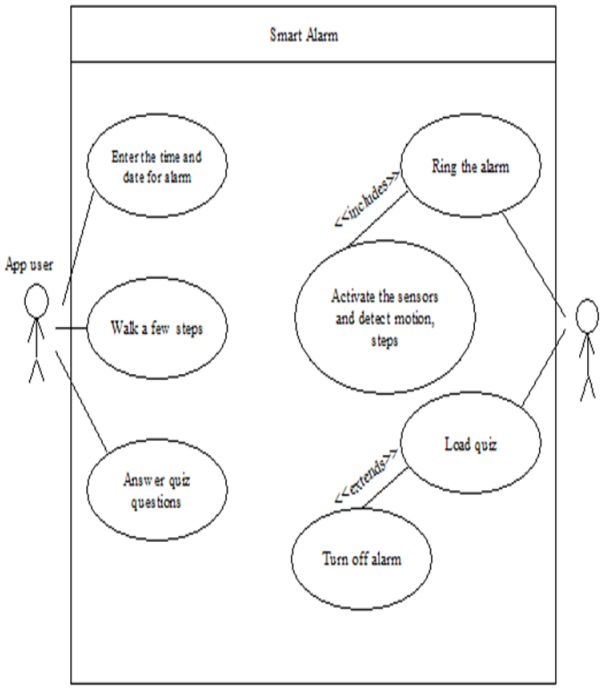

Figure 1. Use case diagram

The use case diagram represents the different app modules controlled by various entities. The app user can only set the alarm time with the date after opening the app (Bombardi-Bragg, 2017). It will be prompted to answer a few questions when the alarm rings. The app controls All other modules like ringing the alarm, loading the quiz questions, activating the sensors, etc. The activity diagram is shown in Figure 2. It represents the sequence of activities that occur in the application. Upon opening the app, the user can set the alarm and then pass the control to the application.

Some conditions must be satisfied for the alarm to go off. The user must walk a few steps when it rings and answer all the quiz questions correctly—not completing either of the two results in the alarm ringing continuously.

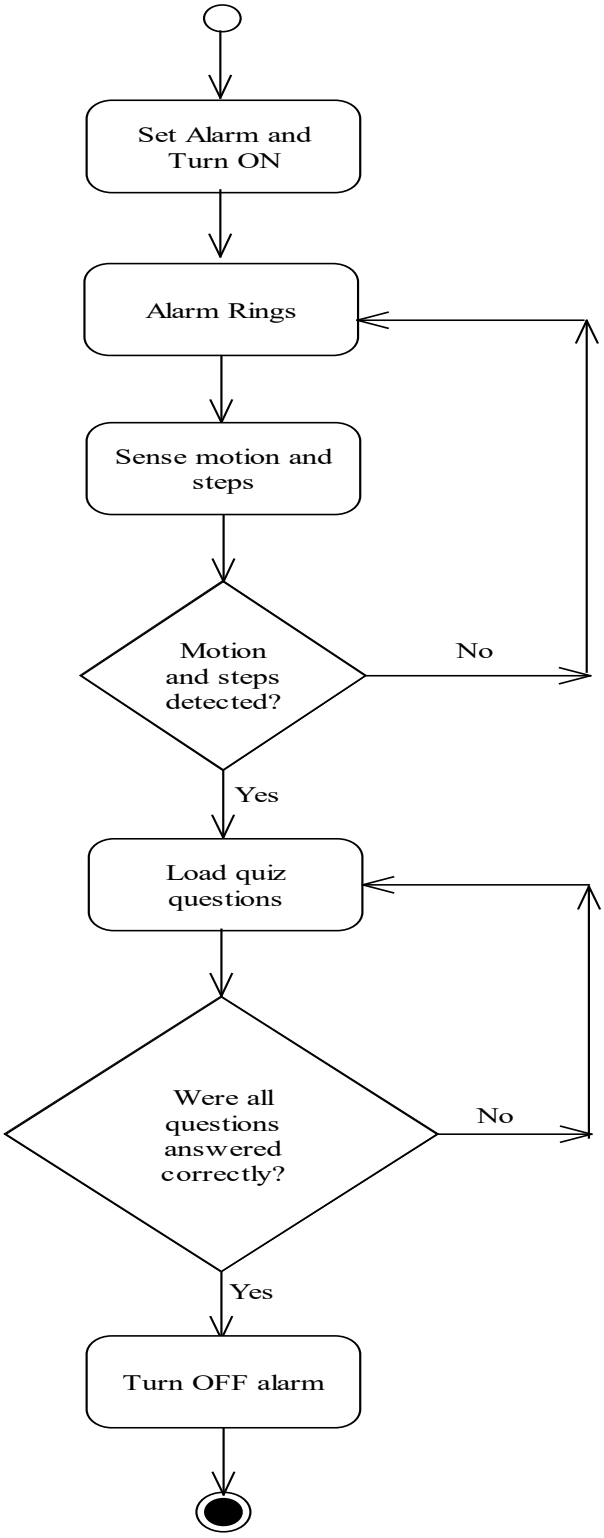

Figure 2. Activity Diagram

3. Results and Discussion

As this work is the development of an innovative smart alarm, this section includes screenshots of the different steps. Figure 3 is the screenshots of the setting of the alarm in the digital/ analogue time picker (Krukowski, 2017). Figure 4 shows the screenshots of detecting the steps and answering the quiz questions. The app is coded so the user must walk at least a minute holding the phone before the quiz kicks in. If the user fails to answer a question correctly, they must wait ten seconds to attempt it again. After a few questions are successfully answered, the alarm stops ringing. Thus, the app is successful in its objective of making the user wake up on time without repeatedly snoozing it.

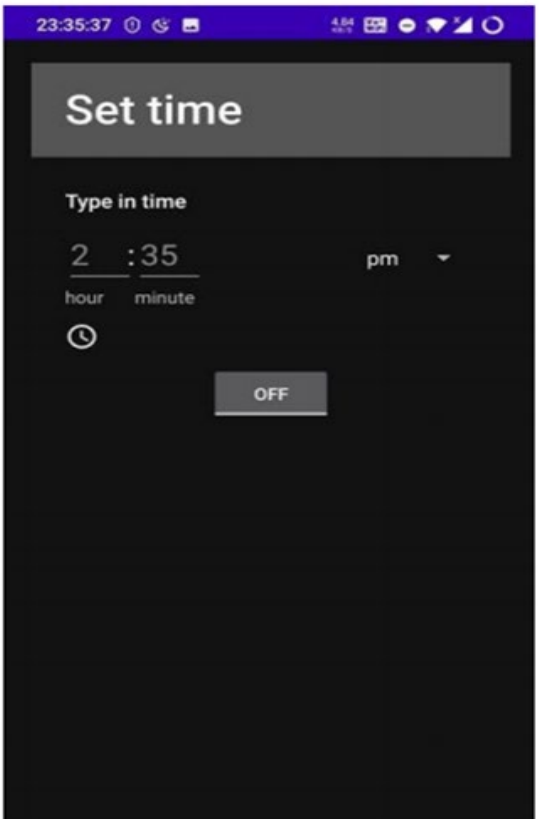

Figure 3. Screenshot of the setting the alarm in digital time picker

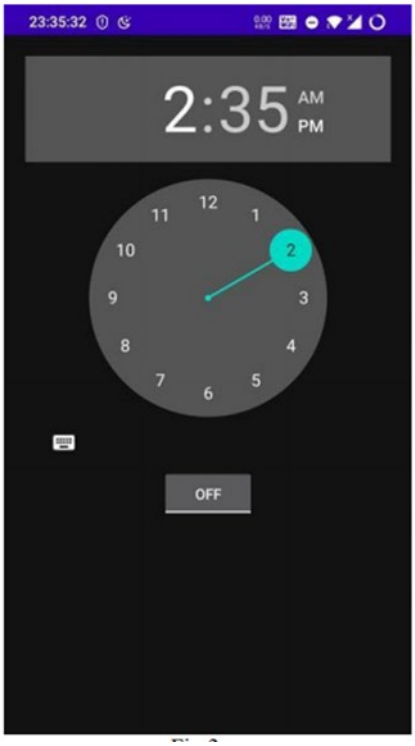

Figure 4. Screenshot of the setting the alarm in analog time picker

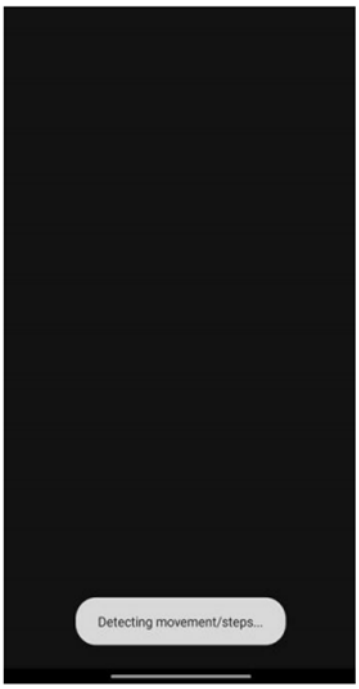

Figure 5. Screen shot of the detecting steps

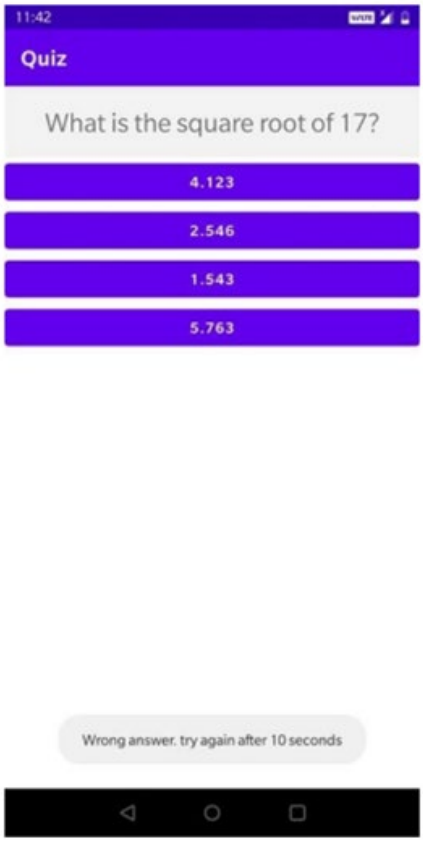

Figure 6. Screenshot of the quiz page

4. Conclusions

Waking up on time is crucial for ensuring the smooth functioning of daily activities. Oversleeping can lead to various negative consequences, such as missing early morning classes for students or skipping important meetings for working professionals. These setbacks can disrupt schedules and hinder productivity. Relying on standard alarm apps can be risky, as they often allow users to snooze alarms repeatedly, making it easier to fall back asleep. This is where SMART ALARM becomes invaluable. Unlike traditional alarm apps, SMART ALARM continues ringing until the user gets out of bed. To ensure wakefulness, the user must complete a quiz before the alarm can be turned off. This additional mental engagement is designed to fully awaken the user, making it highly effective for those who struggle to get up in the morning.

SMART ALARM is particularly beneficial for individuals with difficulty waking up on time. It helps students adhere to their schedules, ensuring they do not miss important classes and supports professionals in staying punctual for work-related commitments. The app offers a practical solution to improve morning routines and overall time management by addressing the challenges of waking up. The app's functionality can be expanded in the future to enhance its effectiveness. One potential improvement includes integrating motivational quotes or speeches that inspire users to start their day positively. This feature could give users a sense of encouragement and purpose as they prepare for the day.

Another possible enhancement is linking the app with Google Assistant. This integration would allow the app to inform users about the weather conditions and remind them of tasks scheduled in their Google Calendar. Such features offer a comprehensive morning overview, helping users plan their day efficiently. By combining practicality with motivational elements, SMART ALARM ensures timely wakeups and sets a positive tone for the day. It is an essential tool for anyone looking to improve their morning routine and productivity.

Author Contributions: Conceptualization, A.A. and V.V.; methodology, A.A.; software, A.A.; validation, V.V.; formal analysis, A.A. and V.V.; investigation, A.A. and V.V.; resources, A.A.; data curation, V.V.; writing—original draft preparation, A.A.; writing—review and editing, A.A. and V.V.; visualization, A.A.; supervision, V.V.; project administration, A.A.; funding acquisition, A.A. All authors have read and agreed to the published version of the manuscript.

Author Initials
A.A. – Ashwin
V.V. – Vijayalaxmi

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Inform Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Acknowledgments: The authors would like to thank Manipal University Jaipur, India, for supporting this research and publication. We also thank the reviewers for their constructive comments and suggestions.

Conflicts of Interest: The authors declare no conflict of interest.

References

Abood, M. S., Ismail, M., & Nordin, R. (2016). A quiz management system based on P2P near-field communication on Android platform for smart class environments. *2016 International Conference on Advances in Electrical, Electronic and Systems Engineering*, 83–88. https://doi.org/10.1109/ICAEES.2016.7888014

Bombardi-Bragg, M. R. (2017). *Exploring App Users' Experiences with App Notifications*. Colorado State University.

Factor, M., Schuster, A., & Shagin, K. (2006). A Platform-Independent Distributed Runtime for Standard Multithreaded Java. *International Journal of Parallel Programming*, *34*(2), 113–142. https://doi.org/10.1007/s10766-006-0007-0

Jana, D. (2014). *C++ and object-oriented programming paradigm*. PHI Learning Pvt. Ltd.

Kasim, S., Hafit, H., Leong, T. H., Hashim, R., Ruslai, H., Jahidin, K., & Arshad, M. S. (2016). SRC: smart reminder clock. *IOP Conference Series: Materials Science and Engineering*, *160*(1), 12101.

Kocakoyun, Ş. (2017). Developing of Android Mobile Application Using Java and Eclipse: An Application. *International Journal of Electronics, Mechanical and Mechatronics Engineering*, *7*(1), 1335–1354. https://doi.org/10.17932/IAU.IJEMME.21460604.2017.7/1.

1335-1354

Krukowski, D. (2017). *The new analog: Listening and reconnecting in a digital world*. New Press/ORIM.

Lowry, O. H., Rosebrough, N. J., Farr, A. L., & Randall, R. J. (1951). Protein measurement with the Folin phenol reagent. *Journal of Biological Chemistry*, *193*(1), 265–275.

Mattingly, S. M., Martinez, G., Young, J., Cain, M. K., & Striegel, A. (2022). Snoozing: an examination of a common method of waking. *Sleep*, *45*(10), 1–84. https://doi.org/10.1093/sleep/zsac184

Mladenov, M., & Mock, M. (2009). A step counter service for Java-enabled devices using a built-in accelerometer. *Proceedings of the 1st International Workshop on Context-Aware Middleware and Services: Affiliated with the 4th International Conference on Communication System Software and Middleware (COMSWARE 2009)*, 1–5. https://doi.org/10.1145/1554233.1554235

Oh, K. T., Shin, J., Kim, J., & Ko, M. (2020). Analysis of a wake-up task-based mobile alarm app. *Applied Sciences*, *10*(11), 3993. https://doi.org/10.3390/app10113993

Page, T. (2014). Application-based mobile devices in design education. *International Journal of Mobile Learning and Organisation*, *8*(2), 96. https://doi.org/10.1504/IJMLO.2014.062347

Ramacciati, N., Guazzini, A., Caldelli, R., & Rasero, L. (2021). User-friendly system (a smartphone app) for reporting violent incidents in the Emergency Department: an Italian multicenter study. *La Medicina Del Lavoro*, *112*, 68–81.

Salman, A. D., Khalaf, O. I., & Abdulsaheb, G. M. (2019). An adaptive intelligent alarm system for wireless sensor network. *Indonesian Journal of Electrical Engineering and Computer Science*, *15*(1), 142. https://doi.org/10.11591/ijeecs.v15.i1.pp142-147

Sarkar, A., Goyal, A., Hicks, D., Sarkar, D., & Hazra, S. (2019). Android Application Development: A Brief Overview of Android Platforms and Evolution of Security Systems. *2019 Third International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC)*, 73–79. https://doi.org/10.1109/I-SMAC47947.2019.9032440

Thomas, L., Eckerdal, A., McCartney, R., Moström, J. E., Sanders, K., & Zander, C. (2014). Graduating students' designs: through a phenomenographic lens. *Proceedings of the Tenth Annual Conference on International Computing Education Research*, 91–98.

Vishnu, R. R., Pal, V. N., Moorthy, C. N., & Balakrishnan, S. (2018). Arduino Based Smart Alarm Mobile Application System. *Jour of Adv Research in Dynamical & Control Systems*, *14*, 1217–1223.