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Development of Chemi-resistive Polymeric Sensors for Innovations in Smart Buildings Interfacing with AI Systems

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Abstract

The Elevator efficiency has become a critical concern in modern buildings, where frequent, unnecessary stops are a major inconvenience for tenants and contribute to significant energy consumption. Traditional elevator systems often halt on every floor, even when not required, leading to inefficiencies that are particularly costly in high-rise buildings. This paper proposes a smart elevator system using Artificial Intelligence (AI) and image processing to address these issues. By intelligently analyzing passenger requests, the system enables the elevator to stop only at desired floors, minimizing unnecessary stops and optimizing energy use. Furthermore, the incorporation of lightweight polymer composites in elevator cabins and sensor housings reduces structural weight and enhances system durability, further improving power efficiency. These materials improve comfort and system dependability by offering superior strength-to-weight ratio, corrosion resistance, and vibration damping. For safer operation, the incorporation of polymer nanocomposites offers enhanced fire retardancy and extra strength-to-weight advantages. Additionally, by facilitating recyclability and reducing material costs, polymer integration promotes sustainability. This innovative approach promises enhanced operational efficiency, improved user experience, and substantial power savings, marking a significant advancement in elevator technology for sustainable urban infrastructure. A more effective, long-lasting, and environmentally friendly elevator solution that meets the requirements of contemporary smart cities is produced by combining polymer composite engineering with AI-based intelligent control.

Keywords: Deep learning, floor prediction, image processing, power saving, smart elevator, YOLO object detection

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INTRODUCTION

Modern elevators extend from the 19th century, whereas vertical transportation mechanisms lasted for longer times [1]. In buildings, elevators are implemented effectively to accommodate people's individuality (products) requirements for vertical transportation. Several standards currently govern the field. The movement of people and goods using elevators is guided by ISO 8100–32, which is part of a broader set of ISO standards that define requirements for elevator systems (ISO, 2020).

An elevator definition describes an electric lift used within the individual transfer rate through the vertical commodities into the building levels while employing bins or silos [2,3]. Elevators still work today much like they did in the past, using electric motors that power counterbalance systems to move the elevator. In modern designs, polymer-based components are often integrated for insulation, noise reduction, and lightweight structural support. Some systems also use hydraulic pumps to push fluid into cylinders, which then lift the elevator through a jack-like mechanism, where polymer seals and linings help improve durability and reduce wear. Composites have been used in various fields, notably manufacturing and agricultural production. Elevators are regularly employed in the most recent multistory buildings, especially in places where accessible ramps would not be possible [4].

The pulley mechanism and the operation of an elevator or lift are similar. Using a specific drive shaft, the water is extracted from the well. This pulley system can be built with a barrel, string, or spindle. An elevator remains essentially a metal enclosure, sometimes integrated with polymer-based structural or protective components, through several design models along with strong metal cords. Moreover, the engine room with the elevator has a sheave where the sturdy metal rope is passed through. In this case, a sheave works like a pulley system with the spindle gripping the rope of the metal case forcefully, and the entire functioning is run through a motor fixed to the system. When the switch is turned ON, the elevator may begin to rise as well as fall, or perhaps the engine might halt. Elevators have grown in importance as a means of vertical transportation as the development of engineering and polymer composite applications has made it possible to construct ever-higher buildings [5]. They enable people to travel quickly without exerting additional physical effort from one floor to another. Elevators are a need in contemporary structures, whether commercial or residential. It is especially true for buildings at a mid and high level because hiking in multiple stories is difficult or impossible for some people, like the elderly and those with disabilities. Technology advancements, particularly the use of lightweight polymer materials, have significantly altered the elevator business [6].

All elevator systems can be improved with proactive, condition-based monitoring and predictive maintenance using artificial intelligence (AI) and the Internet of Things (IoT). Smart elevators can be checked and controlled from far away. They watch how they are working, decide when they need fixing, give regular updates, and offer other helpful features [7]. In 2019, the smart elevator market was worth around $18.75 billion. By the year 2027, the value of the smart elevator market is projected to rise to approximately $38.27 billion, showing steady growth over the years. This means the market is likely to expand steadily each year at an average growth rate of 9.1%. Despite this growth, there are still various ongoing efforts to further develop and improve intelligent elevator technologies. In addition to software advancements, polymer-based composites are increasingly being considered for elevator cabins, panels, and safety linings to reduce weight and improve energy efficiency. Most elevator-related research focuses on reducing elevator wait times, maximizing how much energy they use, and incorporating durable polymer materials for safety and sustainability [8].

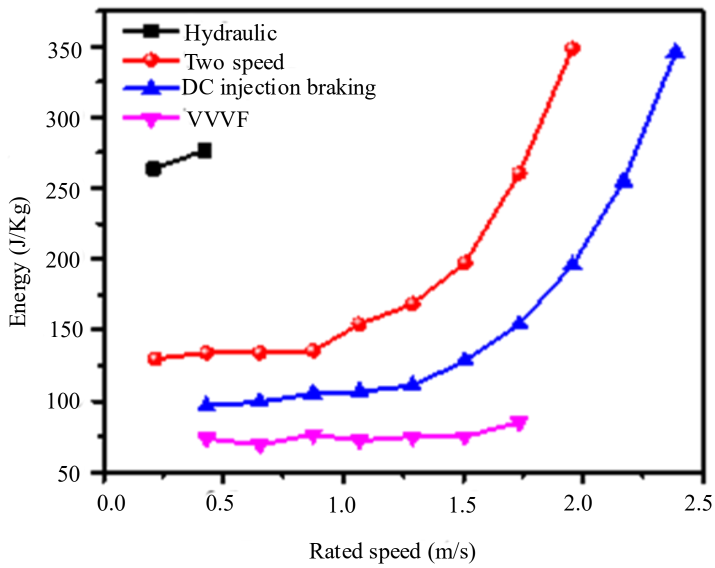

Figure 1. Comparison of the energy usage of different drives.

In fact, the phenomenon related to image processing is explained by the procedural transformation of converting a visual representation into a digital format, which enhances the capabilities essential for the extraction of specific information, as outlined in the proposed framework of image visualization. This framework facilitates the discernment of entities that are otherwise imperceptible, while image recognition is conducted through the identification of such entities and the examination of the diverse patterns surrounding the object representation. This method works by breaking an image into smaller, low-resolution parts while also looking at the whole image to check if certain objects are present [14–16]. For detecting human figures, we used the You Only Look Once (YOLO) model, a well-known and effective tool for real-time object detection. The YOLO method works through several steps, using different neural networks that are specially built to recognize objects and draw boxes around them to show where they are. This method works by slicing the image into a smaller section, low-quality sections while also looking at the full image. Doing both helps to find and recognize the objects more accurately without loss of any frames in the image [10–12]. Also, the final image at this stage can clearly show the detected objects. This helps to partition the image into parts which made it easier to move on to the next steps in the segmentation process [13]. Energy consumption in elevator drives varies: traditional hydraulic drives are typically the least efficient, using more power due to hydraulic fluid movement. Traction drives, particularly with regenerative braking, are more efficient, as they recycle energy. Permanent magnet synchronous motors offer the highest efficiency, using less energy overall by reducing motor losses [13].

Figure 1 illustrates the energy consumption of various elevator drive types at different rated speeds, based on Doolaard's 1992 study [9]. The graph compares four types of drives: Hydraulic, Two-Speed, DC Injection Braking, and Variable Voltage Variable Frequency (VVVF). Hydraulic drives exhibit relatively high energy consumption at low speeds (around 0.6 m/s) and are only depicted at these lower speeds, suggesting limited efficiency and scalability as speed requirements increase. Two-speed drives show a steep rise in energy consumption at higher speeds (above 1.6 m/s), indicating inefficiency in faster operations. Similarly, DC Injection Braking drives experience a rapid increase in energy consumption with speed, further emphasizing their unsuitability for high-speed applications. In contrast, VVVF drives maintain the lowest and most consistent energy consumption across all speeds, demonstrating significant energy efficiency. This data emphasizes the advantages of VVVF drives, particularly for high-rise building applications where minimizing operational energy and costs is essential. As the need for sustainable, energy-efficient building solutions grows, VVVF technology presents an ideal option for modern elevator systems, supporting reduced environmental impact and operational costs.

OBJECTIVE

Nowadays, most elevators are handled manually by various users from inside the elevator car by selecting the preferred position, such as floor level close to the switching panel point. The passengers have a lot of flexibility thanks to this simple yet efficient method. However, once a destination has been selected, it cannot be altered. In a ten-story building, if someone wants to go from the ground floor to the fifth floor using a regular elevator, one common issue is that they might press all the floor buttons inside the elevator. As a result, the elevator will stop at every floor, even if there's no need, which causes delays and wastes time. It consumes more time than before, and a lot of power will be available. Therefore, this system is designed to recognize human body patterns using artificial intelligence. The study focuses on a basic elevator system where one elevator car is attached to a single shaft and moves up and down through a standard high-rise building. In modern designs, polymer-based keypads, panels, and safety linings are often integrated to make the elevator lightweight and durable. The concept of a "single-level car" in an elevator system refers to an elevator car designed to service only one floor level at a time. This is typical of standard elevator systems, where each car is associated with a single set of entry and exit doors that align with a specific floor each time the car reaches that level. This configuration contrasts with multi-level or multi-car elevator designs, where an elevator shaft might have multiple cars operating at different levels simultaneously. The use of advanced polymer composites in these structures can further improve noise reduction, vibration control, and passenger safety.

In the case of a "single-level car" elevator, the system operates using a single elevator car per shaft, meaning the car can only service one floor at a time before moving to another level. This design ensures a simpler structure, where only one entry point is available within the elevator car, making it suitable for straightforward, sequential floor access. In modern models, polymer-based interior panels and lightweight composite materials are often incorporated into single-level car elevators to enhance durability, reduce noise, and improve passenger comfort.

However, this also implies that, once a destination floor is selected by a passenger, the elevator will not simultaneously serve other floors until it completes that trip. For buildings, such as private institutions, universities, or office spaces, this type of elevator is typically well-suited to manage predictable, straightforward traffic patterns. However, in conventional systems, unintentional or mistaken button presses can cause delays since each floor must be visited if selected. With the introduction of AI-based body pattern recognition, the single-level car system can become more efficient by detecting intended destinations more accurately, filtering unnecessary stops, and improving travel speed and energy usage within buildings with varying internal structures, such as lecture halls, laboratories, event spaces, and offices.

In addition to intelligent control strategies, advancements in material technology are equally important for improving elevator performance. The use of lightweight polymer composites in elevator cabins, counterweights, and sensor housing helps reduce the overall structural mass, which in turn lowers the mechanical load on the system. Unlike conventional metallic components, polymer-based materials provide a superior strength-to-weight ratio, resistance to corrosion, and greater design flexibility. These properties not only extend the service life of elevator systems but also minimize maintenance requirements, contributing to more reliable and cost-effective operation.

Theory and Calculation

Tall buildings usually need more energy, mainly because of the elevators that run throughout them. As buildings get taller, the energy used by elevators also increases. Many buildings include elevators that continue to move people from floor to floor even when no one is using them. Sometimes people press all the buttons in the elevator, even if they don't need to. This makes the elevator stop at every floor for no reason. It uses more energy and makes others wait longer to reach their floor. Consequently, electrical waste is steadily rising. Thus, to save electricity, certain new features and technologies are incorporated into the elevator mechanism's suggested system.

The suggested approach includes a controller, data storage servers, and cameras outside the elevator on each floor. In addition, polymer-based lightweight cabin materials and noise-dampening composites can reduce the energy required to operate the elevator and improve efficiency. The technology determines whether a user is inside or outside the elevator and advances to that level when they touch a floor button. Otherwise, it stops at the present floor if a human is identified. The YOLO model, which is used in image processing, integrates into the dimension rate at S*S for the grid that centers the building box within the grid connected to the object detector. In this case, YOLO is applied to the whole image using a specially designed neural network. Each part of the image (or grid) tries to predict boxes around objects, along with confidence scores. These boxes show how sure the system is about where the object is and whether it has correctly identified a person standing in front of the elevator or detected by the elevator’s weight sensor, which may also use polymer-coated sensing elements for higher durability and sensitivity. This proposed system is a categorized into two scenarios that quickly illustrate how the system functions; these two classified cases are explained below.

Inside Case

The elevator's internal technology serves as the only foundation for this case. Here, the elevator works by calculating how much weight it is holding inside. It has a sensor that measures the weight. If the weight is more than what it normally is when empty, the elevator knows someone is inside and goes to the floor chosen. But if the weight has no change, then it stays on the same floor as it considers that no one is inside the elevator. Let's take the example of a home elevator in a seven-story structure. When someone enters into the elevator and they want to go to the third floor, but they accidentally press the fifth floor. The elevator checks the weight to see if someone's inside the elevator or not. If anyone presents the weight gets varied than it goes to the third floor. After the person gets out, the elevator again calculates the weight, if it is empty it doesn't go to the fifth floor since no one's left to go there.

The flowchart in Figure 2 shows how things work inside the elevator. The system checks the expected weight of the elevator (W.L.) and compares it with the actual weight (A.L.) when someone is inside. If the actual weight is higher than the default empty weight, the elevator knows a person is inside and moves to the selected floor. The elevator vehicle won't move if the weight of the elevator and its real weight are equal.

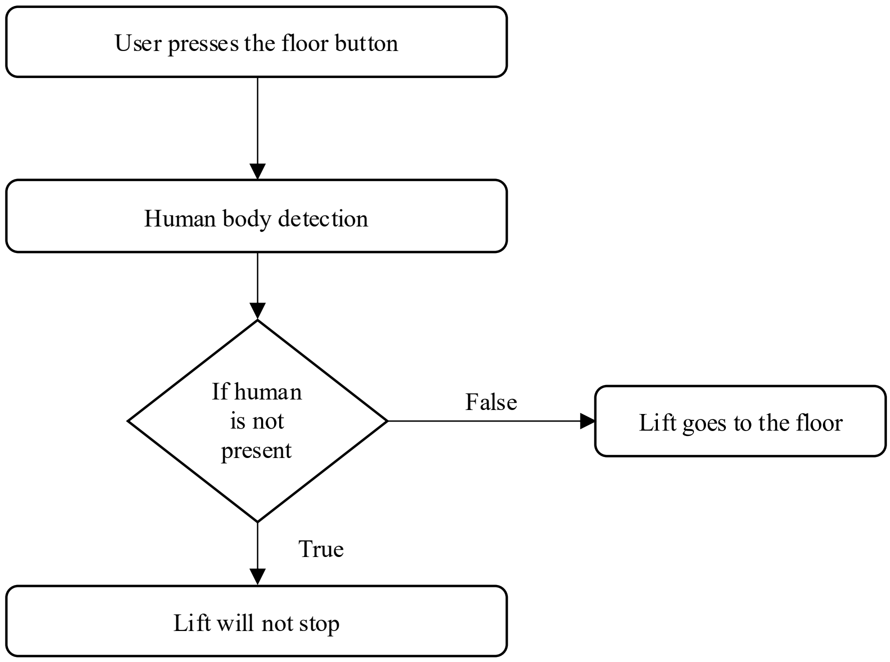

Figure 2. Block diagram of the elevator working for inside case.

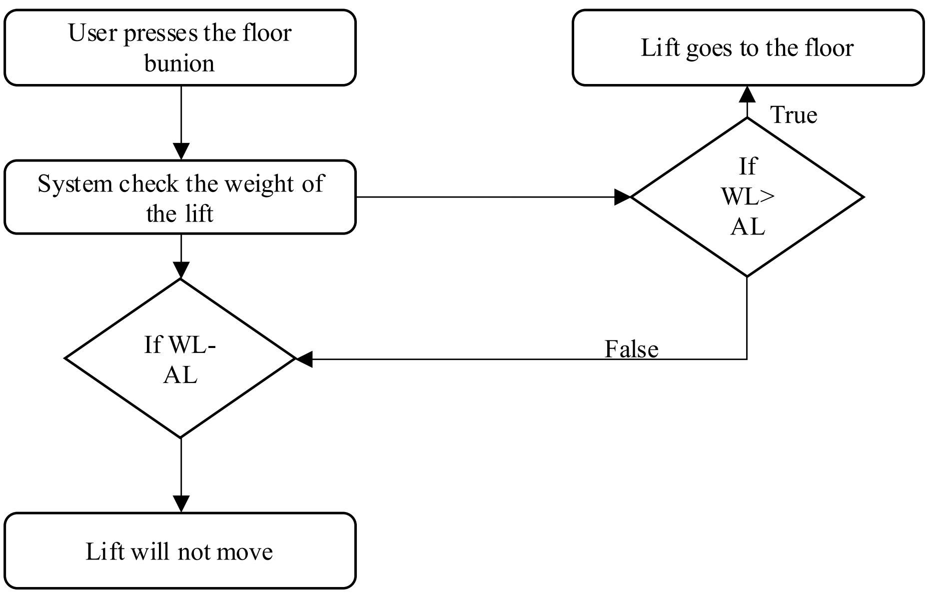

Figure 3. Block diagram of working of the proposed work for outer case.

Outside Case

The system operating outside the elevator vehicle is like the outer case of the suggested system. Every floor will have a camera placed close to the elevator doors. The cameras are utilized to identify patterns in the human body, and the entire system is based on OpenCV with AI. If the system sees a human body pattern, the elevator will go to that floor and stop. If it doesn't detect anyone, it stays on the bottom floor where the last pattern was seen, until it gets a new request. Let us imagine a home elevator in a seven-story building. One person wants to go to the third floor. At the same time, someone else presses the button for the second floor but walks away before getting in. Since the elevator can't detect anyone at the second floor, it will skip that stop and go to the third floor instead. The system then determines whether any human body patterns are detected. The elevator will go straight to the third floor and not stop on the second floor if there are no people on it.

As illustrated in the flowchart above, Figure 3 illustrates how the system uses an object detection technique known as the YOLO model to assess whether a passenger is on the floor while they are waiting for the elevator.

The elevator will only stop at a floor if it detects a human body pattern. If no one is there, it won't stop at that floor. Due to the elevator car's internal and external limits, these two possibilities will coexist. Reducing the energy lost by rarely used elevators is the main objective of this technology. The system works along with both inside and exterior cases. The proposed smart elevator system integrates both internal and external detection mechanisms to optimize its functionality by reducing unnecessary stops and enhancing energy efficiency. In this integrated approach, the elevator operates based on two primary scenarios: user detection inside the elevator and user detection outside the elevator at various floors. By using YOLO-based image recognition for external detection and weight sensor data for internal detection, the system ensures that the elevator only moves when needed, minimizing idle movement and conserving energy.

INTEGRATED SYSTEM OPERATION

Primary Preference Camera Detection (Outside Case)

Cameras with AI-based body pattern recognition (using OpenCV and YOLO) are installed at each floor to detect human presence near the elevator doors. This serves as the primary input for deciding the elevator's movement. When a floor button is pressed, the camera checks for a human body pattern at the respective floor. If a person is detected, the elevator will respond to that floor request. If no person is detected (, e.g., the button was pressed, but the person left), the elevator bypasses that floor, saving energy. This prevents unnecessary stops on floors without active users, improving response times for other requests.

Secondary Preference – Weight Sensor (Inside Case)

Inside the elevator, a weight sensor continuously monitors the load. If the weight exceeds a preset minimum threshold, indicating human presence, the elevator will responds overload and an elevator will usually not move to the selected floor buttons. If a floor button is pressed but the weight matches the default (indicating the elevator is empty), the elevator will remain at the current floor, skipping any selected floors since there is no passenger onboard. For instance, if multiple buttons are pressed inside the elevator car (, e.g., the third and fifth floors), the system will first check the weight. If there is human presence, the elevator moves to the third floor first, checks the weight again, and skips the fifth floor if it detects the car is empty after the user exits.

Simultaneous Operation – Integrating Both Mechanisms

Both camera detection and weight sensing run concurrently to ensure that the elevator responds optimally based on real-time conditions. If there is a request from a floor with verified human presence (from the camera), that request takes priority.

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After reaching a requested floor, if the elevator proceeds to another selected floor, it rechecks its weight at each stop. This double-check ensures that the elevator doesn't continue to floor if it's empty, even if buttons are pressed.

Example of Combined Scenario

Imagine a seven-story building where someone on the ground floor calls the elevator to go to the third floor. A camera placed on the ground floor sees that a person is there, confirming their presence, so the elevator proceeds there.

While inside, the user presses both the third and fifth-floor buttons. Upon reaching the third floor, the elevator's weight sensor detects no occupants (indicating the user has exited). Consequently, the elevator bypasses the fifth floor. At the same time, if someone on the second floor presses the elevator button but leaves before it arrives, the camera on that floor won't see anyone. So, the elevator skips the second floor and moves on to the next floor where someone is actually waiting.

This integrated approach, with primary preference given to camera detection and backed by weight sensing inside, enables the elevator to serve users efficiently while minimizing energy use and avoiding unnecessary stops. The computation of several various parameters included in this work is necessary for a deeper comprehension of the proposed work. The total number of passengers and the estimated average number of stops the elevator makes are explained by this equation. This will give us an estimate of the elevator's power consumption based on visits in Eq. (1) [14].

$$ST = NF\,[1 - (1 - 1/NF)^P] \tag{1}$$

In this section, an expression for the anticipated number of stops an elevator will make during a round-trip ride has been derived from basic principles. The average number of stops was indicated by (S.T.) in the equation above, the total number of floors in a high-rise structure was represented by (N), and the total number of passengers in the elevator car was represented by (P). There are three components to the round-trip time:

a. Time spent in the source floor.
b. The duration of the journey to the higher locations.
c. The time it takes to get from the source floor to the upper floors.

Eq. (2) can be used to determine the overall amount of time spent traveling [14].

$$\tau = \tau MP + \tau S + \tau H \tag{2}$$

Where:

τMP: Amount of time spent on the source floor; τS: Amount of time spent getting from the source floor to the upper floors;τH: Amount of time spent returning from the upper floors to the source floor.

The stabilizing component of a balancing system for the elevator mechanism is counterweight elevator. It is employed in Eq. (3) to rectify the imbalance between the elevator car and the counterweight.

$$EC = 1/2\,(EMC + CW) \tag{3}$$

Where:

EC indicates Elevator Counterweight; EMC indicates Elevator's Maximum Capacity. CW indicates Elevator Car Weight. Can be calculated as: EMC = 3000 lbs; CW = 2000 lbs; EC = 1500 + 2000 = 3500 lbs. Eq. (4) is used to determine the installed elevator's daily energy consumption.

$$E = (R \times ST \times TP) / 3600 \tag{4}$$

Where: E is the energy consumed daily in kWh/day. R is the rating of the motor in kWs. S.T. is the number of starts per day. T.P. is known as trip time.

$$C = ICP \times CC \quad (5)$$

Where: C indicates conditional class probability for the object. ICP indicates individual box confidence prediction. CC indicates conditional class probability for class.

In the YOLO object detection model, the confidence score (C) shows how sure the system is that an object is present inside a predicted box given in Eq. (5) can be computed using the equation that follows.

T.P. values based on several criteria, including drive type, speed rate, and floor count, are listed in Table 1. As a result, the above table lists elevator services for different installations with different types of drives [15]. All the elevator energy characteristics seen in both high-rise an low-rise buildings are shown and explained in Table 2. The values derived from the proposed study are contrasted with the practical elevator energy issues [15].

RESULTS AND DISCUSSION

A variety of elevator energy characteristics are displayed through Figure 4 which offers a thorough understanding of the various elements. The figures below demonstrate the comparison of different parameters with the values generated by the suggested work. In Figure 4, The values in the graph are divided into two main groups: "High-Rise Buildings" and "Low-Rise Buildings." Each of these groups is further broken down into three categories: "Residential Apartments," "Commercial Offices," and "Proposed Work."

Table 1. Values of the parameter T.P. for various drives and installations.

Drive	**Floors above ground**	**Trip Time in Seconds**		
		Range		***Mean***
Hydraulic	Without Counterweight	Less than 6	5-7	6
Geared	A.C. 2-Speed	6	9-12	10.5
	ACVV (High Mass)	12	7-10	8.5
	ACVV (Low Mass)	12	5-8	6.5
Gearless	Motor- Generator	18	4-6	5
	Thyristor	18	3-5	4

Table 2. Comparison of various energy aspects with proposed work.

Elevator energy aspects	**High-rise building**			**Low-Rise Building**		
	Residential apartments (H.A.)	***Commercial office (H.O.)***	***Proposed work***	***Residential apartment (L.A.)***	***Commercial office (L.O.)***	***Proposed work***
No. of trips per day	340	504	388	176	589	351
Running Power, P_r (W)	13,000	13,000	10,000	4,900	8,500	3,082
Standby Power 5 min, P_{st5}(W)	252.6	252.6	252.6	190.25	120.1	145.7
Non-Running Power, P_{nr} (W)	1,749.1	1,749.1	1,499.1	1,645	409.8	821.9
Daily energy consumption (kWh)	49.81	52.52	39.39	5.53	29.68	14.08
Annual energy consumption (kWh)	14,485	13,617.6	10,819.5	1,656.48	6,422.88	3,039.68

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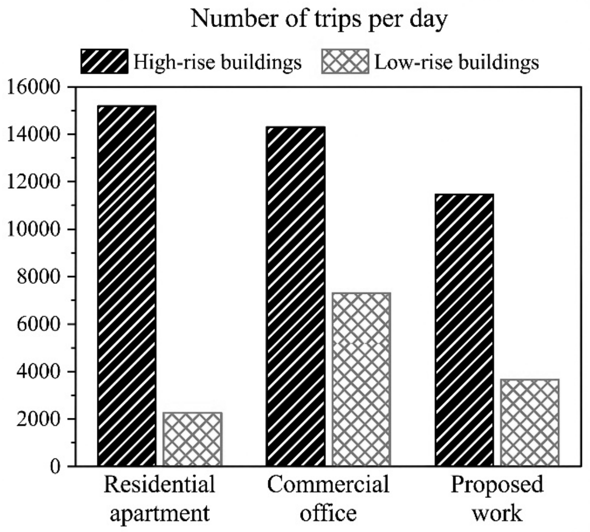

Figure 4. The number of trips in various energy factors.

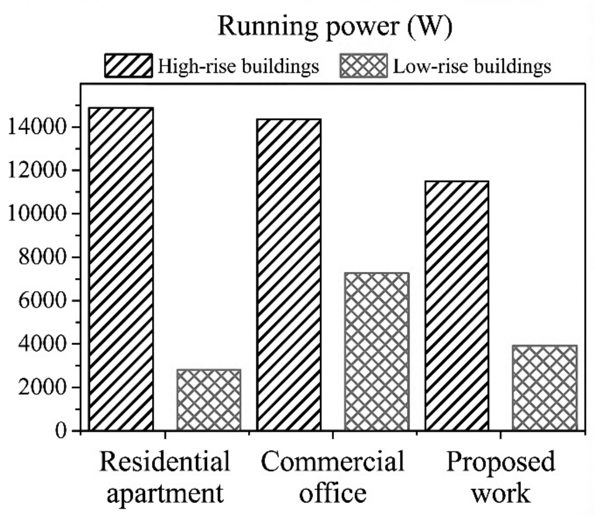

Figure 5. The comparison of operating power consumption across several energy-related factors.

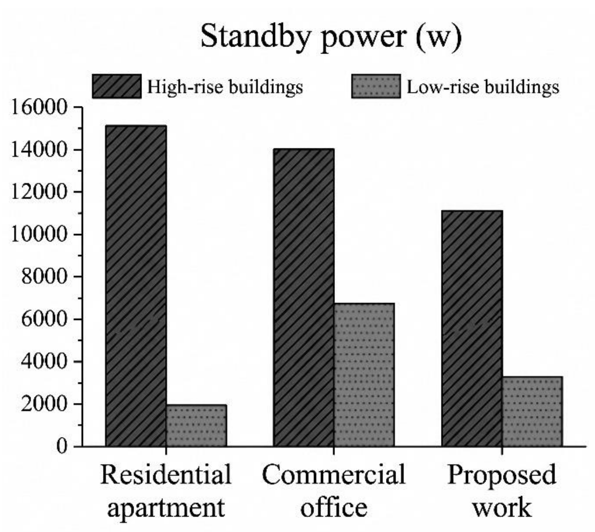

Figure 6. The power used in standby mode.

Figure 4 compares the daily trips made by a typical elevator in various locations, including commercial offices and residential apartments, and the proposed work yields the best results of all the examined values. Similarly, Figure 5 demonstrates how the efficiency attained in the proposed work compares to the total power used by the elevator when operating in various locations.

Figure 6 illustrates the amount of energy an elevator consumes while in standby mode across different settings, including both high-rise and low-rise buildings. The findings of the power usage in various buildings, while the elevator is not moving people from floor to floor, are shown in Figure 7.

Figures. 8 and 9 present the elevator service, along with its energy-related components, is analyzed in both low-rise and high-rise buildings. This comparison gives a clear view of the energy usage in each type of building and highlights the differences between existing systems and the proposed solution. Table 3 illustrates the cost analysis; it helps outline the costs and benefits of implementing the YOLO-based system for elevator button monitoring. It includes estimations based on typical operational impacts, assuming data gathered from preliminary observations [16–20].

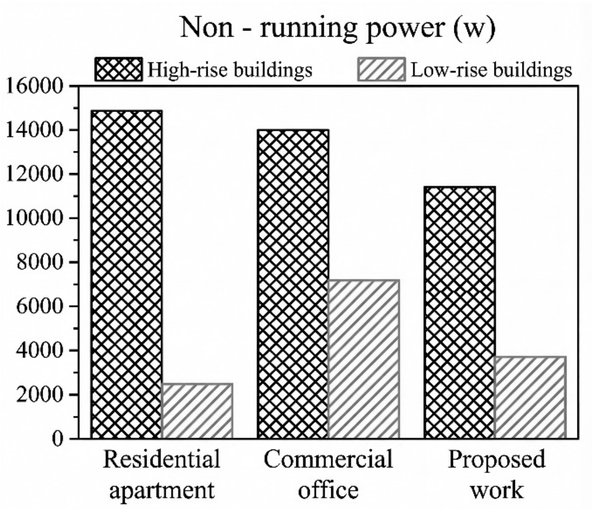

Figure 7. The difference between the energy usage while the elevator is not operating.

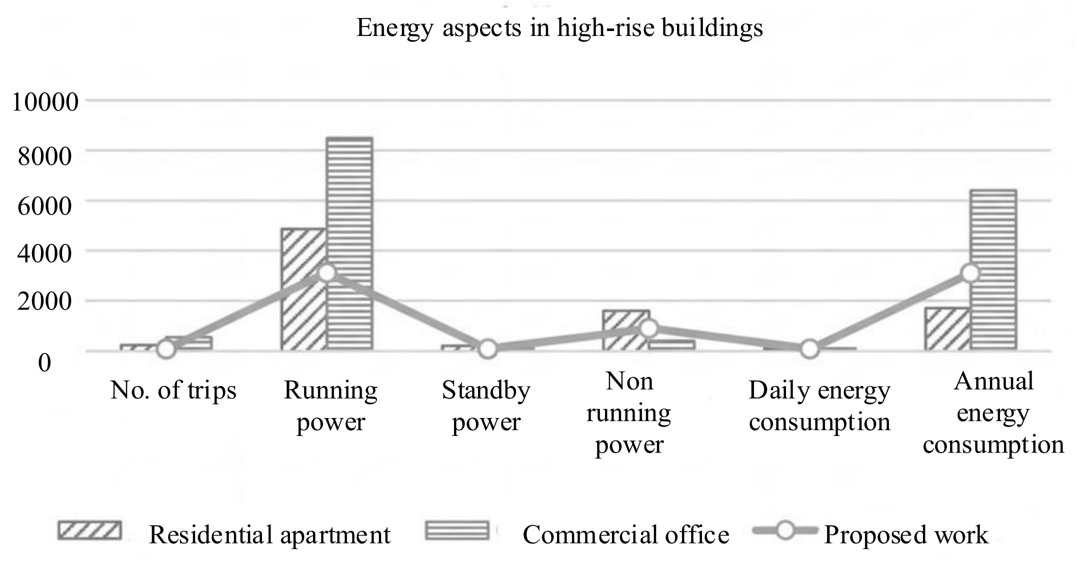

Figure 8. This graph shows a comparison between the energy usage of elevators in high-rise buildings and the results from the proposed system.

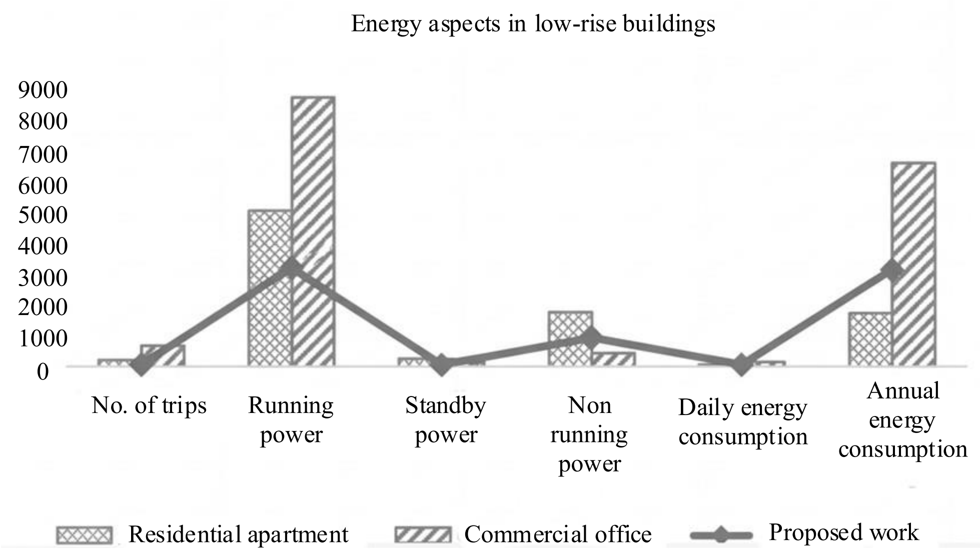

Figure 9. The graph contrasts the suggested research findings with the energy-related elements of elevators in low-rise buildings.

Table 3. Cost-benefit analysis of implementing YOLO-based system for elevator efficiency.

Parameter	Without YOLO	With YOLO	Difference	Explanation
Annual Energy Consumption (kWh)	15,000	12,000	-3,000	Reduced unnecessary stops lower energy usage.
Energy Cost ($/year)	$2,250	$1,800	-$450	Assuming $0.15/kWh.
Maintenance Cost ($/year)	$1,200	$1,000	-$200	Less wear-and-tear with optimized stops.
Passenger Time Savings (hours/year)	0	150	+150	Reduced unnecessary stops save time.
Passenger Satisfaction Score	3.5/5	4.2/5	+0.7	Improved efficiency and reduced delay.
YOLO System Cost ($/year)	$0	$800	+$800	Cost of implementing YOLO system.
Net Annual Savings ($)	-	-	+$550	After deducting YOLO costs.

Annual Energy Consumption and Cost: The YOLO system reduces unnecessary elevator stops, leading to estimated energy savings of around 3,000 kWh annually, translating to a cost saving of $450 based on an energy rate of $0.15/kWh.

Maintenance Cost: With fewer unnecessary stops, the mechanical components experience less wear, which can lead to lower maintenance costs. Estimated savings here are around $200 annually [21]. Passenger Time Savings: By reducing unnecessary stops, the YOLO system can save passengers around 150 hours annually, increasing overall efficiency. Passenger Satisfaction: Improved elevator performance contributes to higher passenger satisfaction, as reflected in survey data or feedback. YOLO System Cost: Implementing the YOLO system incurs an estimated annual cost of $800, including hardware, software, and maintenance expenses [22–25].

The net annual savings from implementing the YOLO system would be approximately $550. This Figure considers the operational savings and cost of the YOLO system, indicating that it is a cost-justified investment in terms of improved efficiency and reduced operational expenses. Table 3 provides a clear, quantitative justification for implementing the YOLO system based on empirical data and estimated operational impact. Further analysis with actual frequency data over a testing period would refine these estimates [26,27].

A promising avenue for prospects lies in the adoption of lightweight polymer composites within elevator cabins, counterweights, and sensor housing. By reducing the overall structural mass, these materials can significantly lower the mechanical load on the system. Their excellent strength-to-weight ratio, resistance to corrosion, and flexibility in design make them suitable for extending service life while minimizing maintenance needs. When combined with AI-driven control strategies, polymer-based innovations have the potential to create elevator systems that are not only smarter but also more energy-efficient and sustainable, aligning with the long-term vision of next-generation smart buildings.

CONCLUSIONS

This work proposes a smart elevator system that uses artificial intelligence to lower the average power consumption of an elevator. Numerous numerical calculations have also been made for residential apartments as well as commercial offices in the category of both high-rise building and low-rise building by taking various energy aspects in the elevators into consideration. The proposed smart elevator system uses image processing and the YOLO model to identify human body patterns using cameras placed outside the elevator. The elevator only stops when the body pattern is recognized, and for the inside case, the system will automatically compare the elevator's weight with passengers with its actual weight when there are passengers inside. The elevator goes to next floor, when the elevator's weight with passengers exceeds the actual weight of the elevator; otherwise, it remains at the current floor, reducing the number of instances where the elevator would have normally traveled even in the absence of people. Compared to the existing elevator system, this lowers number of trips per day and, as a result, reduces power consumption. This system reduces power consumption and will be more helpful in an emergency so that people using the elevator do not have to wait longer on lower or higher floors.

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