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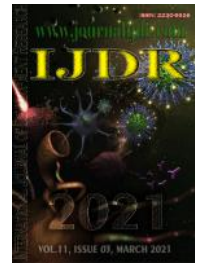
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## AUTOMATION HOME: AUTOMATION ADAPTATION PROJECT IN HOUSE MANAUS FOR DISABLED PEOPLE WITH LOCOMOTION DIFFICULTY.

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### ABSTRACT

Freedom is an attribute that governs the life of society, since it allows displacement, autonomy and, the principle of coming and going, which becomes such a simple condition to exercise, when you are not physically disabled. The streets, the houses, the bus stops, the ramps of the sidewalks, in short, the places themselves are, for the most part, gigantic obstacles for a physically disabled person in Brazilian cities, which has had a special attention from the authorities in recent years, and such places have been gaining important signs and adaptations for social inclusion, allowing the mixing of possibilities, and the insertion of the physically disabled into places that would previously have been unimaginable. For a private sector, such as a house, where the principle of mobility accentuates the difficulties of autonomy, in the case of a traumatic resident with impaired leg movements, whose mobility happens in a limited way and, based on studies that highlight the robotics applied to automation of homes, adapting them for the mobility of residents, or even focused on comfort, this article addresses the automation of a sector of a residence in the city of Manaus, whose resident had mobility difficulties, even having access to a wheelchair, their mobility in the residence was extremely limited. The proposal presented highlights the automation of an elevator to interconnect the floors of the house, as it is a two-storey residence, the spiral stairs did not allow the disabled access to the second floor, leaving them vulnerable and confined to a room and when it had to be moved, it would have to be carried and so with great difficulty. In order to carry out the study, the engineering methodology was used, aimed at solving the problem by producing an action protocol that uses automation to adapt the residence and the mobility condition of the resident. For this purpose, a survey of the home automation properties was carried out. criteria of health and well-being of the patient, as well as the adaptable characteristics of the residence for locomotion independently. What is expected with this study is to value the principles of automation to facilitate the movement of a resident within his own residence, thus facilitating his access with autonomy and a certain degree of freedom.

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## INTRODUCTION

Due to access to diverse places and not adapted for the mobility of disabled people, much has been discussed about this access of people with these limitations to environments that were not thought and / or planned for inclusion. In the search for rights, based on the precepts of citizenship and social well-being, Brazil seeks to mediate such conflicts, signalling environments and improving infrastructure in different places, but it is still a long way from a promising reality that can match equal rights for all, since the freedom of access for the physically disabled requires investments, adaptations and environmental education, which requires special attention to the requirements specified by health agencies, social movements and

others. The Brazilian Inclusion Law (LBI) in its Article 2 highlights that people with disabilities are those who have long-term physical, mental, intellectual or sensory impairments, which, in interaction with one or more barriers, can obstruct their full and effective participation in society on equal terms with other people. Based on these precepts, the mobility of people with disabilities in the social environment requires that attitudes be taken that move the entire society itself, as a counterpart to a complete interaction of conformities indicating differences to treat them with a particular look, thus giving opportunity for each citizen to enjoy the same rights indiscriminately. Adapting a home means bringing dignity to a person with a disability who feels limited within a restricted space and prone to producing illnesses due to the limitations imposed both in the psychological and physical context. Technology tends to combine useful tools to

enhance actions that will meet the needs of everyone who, for different reasons, is dependent on a wheelchair or other support tool to mitigate a disability. IBGE data (2020) as a projection of the demographic census proposes the mapping of people with disabilities in Brazil, since the international convention on the rights of people with disabilities is based on Decree No. 6,949, of August 25, 2009, expresses the main objective of promotion, protection, tends to ensure the full and equitable exercise of all human rights and fundamental freedoms by all persons with disabilities and the promotion of respect for inherent dignity. The policies of interest in promulgating consistent evidence and information for the class of people with disabilities include supporting decision-making and defining the disabled and their specificity, since the greater the propensity of some social groups to express interest in class struggles, whose characteristics for people with disabilities are the age group, sex, education, location and area of residence and the per capita income of the population. On a historical scale, it dates to 1872, the first disability investigation for the Brazilian population and in 1989 Federal Law 7853 (Article 17) highlights the mandatory questioning of disability issues in demographic censuses. From then on, the information became more concise because takes possession of data collected in real action from the | Institute. According to the 2010 census, the highlight is that on average 24% of the population has some type of disability, the highlights being those people who have difficulty carrying out a specific task, as a pending formation of concepts that promotes the movement of resources, whose aspect of change leverages great difficulty, as some individuals have limitations to perform certain movements due to their high comorbidity. The World Health Organization (WHO) establishes the conceptual framework that highlights the international classification of functionality, disability, and health (ICF) whose aspects classify the deficiencies by their form of expression. The National Health Survey (PNS) - 2013 describes that physical disability has a prevalence of 1.3% indicating that 0.3% of the population was born with some disability and 1.0% acquired the disability due to accidents or illness, and that 46.8% of people who have difficulties have an intense or very intense degree of limitations, or who are unable to perform simple daily activities, 18.4% of the disabled public are seeking some type of rehabilitation, which highlights the need to foster means of adapting the environments of these people, among the needs here stands out in this work the inclusion of the physically disabled. Realizing the limitation and mobility of a certain individual in his residence, whose structure has two floors, this study proposes to indicate ways of adapting access to the upper environments of the residence with the use of technology, planning the automation of a structured elevator to transport the disabled to the second floor of the house, since the house only has one way to access the second floor, which is a spiral staircase. To carry out the study, a home visit was made, the building's stability conditions were observed and, finally, to plan the elevator implantation project using home automation, to facilitate the mobility of the individual. It was also observed some difficulty in accessing the residence in an external factor, due to the access to the residence being steep, whose rugged terrain requires greater effort for the citizen to move around, for this reason the project must also include improvements in accessibility outside the residence. The study was carried out in a region of typical houses in the city of Manaus in the west zone, whose conditions of basic sanitation and urbanization of the quality of the urban environment are very precarious. The methodology used was exploratory and field research, with a qualitative character because it explores data and highlights them without measuring their correlation between impact factors. However, the formulation of the adequacy of a residence to receive a device planned from its conception for the implementation of a system that allows the mobility of the disabled inside and outside the residence, with greater independence and autonomy.

Home automation, according to Oliveira (2019) promotes the replacement of return wiring in electrical installations with data cabling and microcontroller systems, that is, it allows the conventional system of electrical cables and switches, described by standard, to be replaced, whose adaptation of automation of the residence or part of it bringing to the circuit the interfacing between

the microcontroller and the residence in yes, allowing to program in its electrical plan of the residential structure. In view of this chain of possibilities, the use of home automation to allow the mobility of a person with a certain degree of limitations within their appropriate residence has social, academic, and scientific relevance, since in the social aspect it promotes health and well-being for those in need. of more mobility, in the academic sector it reflects the challenge of inserting adaptation ideas for the implantation of the device and in the scientific sense that all the aspects guided in this study allow conversation regarding the cause, making it possible to discuss points of differentiation within an action perspective for mediate a problem that afflicts a certain population. This study is expected to demonstrate the possibility of applying an automated system to mediate a problem of a social order, more especially, to bring experimental science to the communities, since the feasibility of application of the system, it is not intended here to actually implement the device, it is proposed to study, to raise the conditions of action and to allow them to propose to carry out the activity, it is necessary to bring to the knowledge of people engaged in the social sector the information that will allow to activate resources for the application, whose monitoring, application determination and others, must be duly followed up so that the idea prevails in the scientific technical basis of suitability of the residence for the mobility of the disabled for any floor of the residence. As this is a suitability for a wheelchair user, the entire structure of the elevator must be equipped with sensors so that it has autonomy to operate the device.

## THEORETICAL REFERENCE

To know the structure of the work, it is necessary to seek knowledge on the topic of home automation, whose particularities will be expressed in this study, home automation covering the most different ways of implanting sensors and other tools that cause mobility in people, especially those that have some kind of physical limitation.

## HOME AUTOMATION

According to Oliveira (2019), Home Automation is a set of components that aims to trigger / move or monitor the most diverse loads and variables within a building to promote convenience, safety and efficiency for the user, this term means status and has a relatively high price for the acquisition. The automation of a residence and the adaptations that justify the insertion of technological parameters have to be based on the notions of equity with regard to the use of electrical energy, the building electrical installations, in the traditional format, follow predetermined norms that extend since its distribution as all the dimensioning of equipment and conductors, since the conductors can be qualified by the economic characteristic and accessibility in the market, the most used ones are copper and aluminium. ABNT NBR 5410 (2004) standardizes that there is a series of minimum value requirements for installing conductors and safety equipment. The parameters indicate that for the minimum section of the supply conductors of a lamp, it must have a minimum section of 1.50mm<sup>2</sup>.

What reflects in view of ANEEL's indication (2010) that in building electrical installations there are standards defined by the voltage concessionaire of 117Vac or 220 Vac voltage with the nominal frequency of 60 Hz, the cables used in the installations are dimensioned for three Phases, Neutral, Return and Earth. What highlights the standardization of the system to be used. According to Oliveira (2019), Alves (2003), Teza (2002) Sebrae (2015) and Gomes (2016) home automation is an impacting technological tool and refers to:

“Union of the words domes and robotics. Domus of Latin origin has the meaning of home and the word robotics is the science that develops automated mechanical systems controlled by an electronic system. Home automation is the union of sensor technologies, logic controllers and actuators that perform interventions in the building controlling the systems. Starting from a coincident idea of automation carried out in industries, home automation aims to replace, mainly,

repetitive and monotonous actions of humans by mechanized and automatic systems. It can be an expensive tool, costing 1% to 7% of the work and, in some cases, buying it would be difficult for some individuals. SEBRAE (2015), predicted an advance for this sector and that companies like Google and Apple would be interested. As the cell phone in the 90s was also a rare tool to be purchased and has, over time, become one of the most used tools by everyone. Thus, the home automation system can also reach this level, as it contains all the essential tools for an individual. According to Gomes (2016), in the technology development process from the 70s onwards, it allowed ideas of social improvements for people with physical needs to develop together with the technology development process. Consequently, guaranteeing them better living conditions" (OLIVEIRA, 2019. Pag. 03). because it contains all the essential tools for an individual. According to Gomes (2016), in the technology development process from the 70s onwards, it allowed ideas of social improvements for people with physical needs to develop together with the technology development process. Consequently, guaranteeing them better living conditions" (OLIVEIRA, 2019. Pag. 03). because it contains all the essential tools for an individual. According to Gomes (2016), in the technology development process from the 70s onwards, it allowed ideas of social improvements for people with physical needs to develop together with the technology development process. Consequently, guaranteeing them better living conditions" (OLIVEIRA, 2019. Pag. 03). The automation of residential systems is a very big trend in the current market, since the availability of technologies and the constant demand for improvement of safety devices, quality of life and adaptations in unhealthy systems, give credit to home automation as an option for new ways of implementation. Leal (2020) highlights the need for maintenance on machines and devices that require certain alignments for their proper functioning, which is why the parameters used for the functionality must follow strict standards of adjustment and solutions. The observation that one tends to work in an authentic way and its long-term planning to sustain a labour demand balancing maintenance and operation costs.

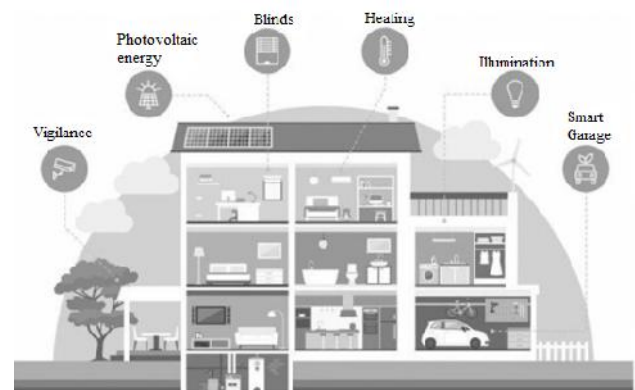
Júnior (2018) highlights that, in the midst of the home automation process, the integration of the incorporation of structures to make homes smarter, such as the insertion of the Internet of Things (IoT), however the innovations are complemented in the devices expressed in the sensors that monitor the environment, actuators that are able to act or modify the environments and the controllers that are responsible for receiving information from sensors and / or users, decode the expressed functions and interact with the environment, this tool promotes a set of actions that programmed are able to elucidate the conditions of application in a real problem. It is up to the automation processes to make use of emerging technologies, those that need experimentation to gain market, but which are known to be effective, the combination of tools is a strong condition that links advantages, both in operation and economically. Home automation inserts automation principles that go against the reading aspects of CNCs for mold production and application in autonomous systems. Pedraça (2018) mentions that the production of intelligent systems that promote human-machine interaction to automate systems gains dimensioning in the front lines of technological creations, because it produces an efficient and low-cost system. Júnior (2018) draws attention to the difference between home automation, insertion of intelligence and home automation, it is necessary to be clear about each of these tools. Thus, the automation of a system that addresses several technological factors to promote a solution is what is sought with the compilation of n tools in echo of homes. This factor can be of great impact, because depending on the application that is estimated, a residence can be automated in its entirety or just one segment, it depends a lot on the demand for a service or the availability of resources for the user.

## AUTOMATED HOUSES

To understand the application of home automation and automation or to mix them, because projects separated by sub-areas of home automation, such as automation, security, entertainment, and others overlap, in this way automation refers to the insertion of electric

motors and controllers to any home device that wants movement and can be controlled by remote control for example. However, automation transposes this aspect that can be used other inputs such as the use of timers and others to promote autonomy in the devices of the house, so automation is part of home automation since combined with a certain technological factor can be highly differentiating. Although there is an interest in bringing comfort to people, there are many challenges that tend to make it impossible to carry out activities that enhance values for people who have special needs and who remain confined in unhealthy environments due to the lack of option for the lack of structure in the rooms of the house. Home automation, combined with the expertise of a professional dedicated to solving a problem, such as the case of a resident who lives confined in a certain department of the house due to the lack of accessibility in the building, thus, home automation corroborates by making systems automated and signalled with the help of sensors and other devices that give a new look to mobilities, making it easier for residents to access intelligent systems with low cost of construction and adaptability.

Figure 1 describes a residence that received automation application in several of its departments and that becomes an environment of mobility of diversity of actions, this is the perspective of a futuristic residence that takes in its essence the technological innovation for presenting convergent factors of environmental improvement and users' living conditions. Pedraça (2016) points out that the quality of energy is a major factor over the autonomy of a system that works operating on an orderly scale, since the systems are developed to receive a certain supply of energy that kept constant and aligned maintains its desirable functionality and protecting linked devices. In this way, factors of external characteristics, but of such great value within a scale of supplies for job generation, the scale of qualified energy application subsidizes healthy conditions of functionality. Thus, the house having its energy supply system balanced, try to be balanced in maintaining the devices, minimizing costs, and making it attractive to judge technological insertions.



Source: Júnior (2018)

**Figure 1. Automated house in some strategic points**

With the application of automation devices, several sectors were impacted, such as the appliances that can be monitored on consumption, heating and energy, the issue of safety, the various devices are subsidies that make the automated system attractive and challenging, as it requires prior knowledge for the acquisition of equipment and its correct implementation. In smart homes, sensors and operators are a key part of automation, since the main objective of home automation is to monitor physical quantities and, depending on their interpretation, it is possible to carry out control of operators, thus highlighting who can control and how to make the system adjust. The sensors used in home automation are the type for light application, temperature, and presence, but these sensors can be better adapted and used more effectively directed to other applications.

The presence sensors that signal the presence of people and or things by infrared or RFID signals on a door, but the photoelectric presence sensors that can be used as barriers or reflective type, allow to identify the presence of an invader by the electronic stimulus (barrier,

reflective or diffuse) although they are very important for the identification of systems control, there is no denying the importance of sensors for system control. Related to the actuators, a system can be monitored through devices that signal the actions that can be done with luminous, audible and other indications, but for the system to protect itself it is important to use relays or electronic switches for the on / off control, a system that operates on home automation principles has to reconcile the impulses managed by sensors, controllers and actuators. Ginjo (2017) proposes the hybridization of the system, for the automation of tasks whose options are programmed to operate together with services provided by the equipment that automate these tasks, directed to the management of four essential functions: comfort, energy efficiency, security and communications. Because in a universe of movement, the home automation system makes life and work more versatile by providing an intuitive interface that offers the user the autonomy to be able to control all the functions of managing their home through their computer, smartphone, or any other device with access the Internet. As it is remarkable the use of automation requires a certain zeal with the dimensions of the applications that are intended to be activated, since the logic of the applications requires a synchronization of actions that are managed by certain devices and the more mobile, such as the cell phone, for more use.

### ELEVATOR ADAPTED FOR DISABLED PEOPLE

The accessibility of people with disabilities is a subject that is much discussed nowadays, because in the buildings that were built throughout history, there was no concern with accessibility, throughout the times the right to a significant portion of society, which has suffered and suffers from the lack of infrastructure that allows its mobility with autonomy and citizenship. Arruda (2016) points out that "Disability is any physical, mental or sensory restriction, of a permanent or transitory nature, which limits the functional capacity to perform one or more essential activities of daily living". According to Brazil (2005), which asks the question: can the physically disabled have adequate mobility at a university and be able to study it independently?. As an answer, one must consider the architecture of the place, the ramps, bathrooms, rooms, doors, and tables suitable for this part of society, since every person with disabilities and / or special needs or with reduced motility, has their rights guaranteed by "Universal Declaration of Human Rights", by the 1988 Charter, the World Health Organization, the United Nations and other federal, state and municipal laws. Such laws aim at the realization of a human society and with guaranteed accessibility. To this end, not everything that appears in the Law or that is signalled to respond to a condition that contemplates the citizen who lacks these demands, and the whole circumstance of formalities leaves something to be desired in the face of need. Chagas (2019) describes that according to studies carried out by the Brazilian Institute of Geography and Statistics (IBGE, 2018), "Brazil has 45.6 million people with some type of physical disability, this number represents 23.91% of the Brazilian population, most of whom live in urban areas, which represents about 38.5 million inhabitants. To assist in the daily lives of these people and guarantee the right of everyone to come and go, buildings need to adapt to accessibility standards, in vertical transport that is up to elevators the rules are also clear and determine a series of items for accessibility in vertical transport, which are defined in the standard; the NBR 12892-2009 that determines several security items and installation of residential elevators" (CHAGAS, 2018, p. 01). The initiative for a residential elevator project is to allow people with reduced mobility to travel. The idea is to produce a low-cost single-family elevator and the structure and configuration of a traction system adapting to new technologies for regenerating electric energy to reduce its consumption, using materials that are easily accessible on the market for its manufacture, which meets up to two floors. For the implementation of the elevator, the specifications that the NBR 8800: 2008 standard describes must be met, since the dimensioning of the preliminary profiles will be subject to bending and everything comes from the standard related to the maximum displacements for structural elements subjected to bending have a maximum value permissible 15mm for bi beams supported as a function of the free

span of the beam, it is noticed that the maximum permissible displacement where the  $f_{max}$  is the maximum permissible displacement and L is the free span of the part according to equation 1.

$$f = \frac{L}{3} \quad \text{eq. 1}$$

These factors must be observable and also the inclusion of automation in the system is configured to adapt the respect to the norms to the innovation principles that and intends to insert in the formulation of the system, this takes into account the resistance of the materials. Whose formula that allows to calculate the stress by the ratio between the axial force and the stress area in a traceable component, by Hooke's Law that highlights the relationship between the stress, the elasticity and deformation module that is applied to an object.

$$\alpha = \frac{F(x)}{A(x)} \quad \text{eq. 2}$$

It is still possible to measure factors related to resistance by equation 3 that calculates the variation in the cross section, whose homogeneous material and uniform load along the length of the bar.

$$\alpha \Delta x = \frac{F(l)}{A.E} \quad \text{eq. 3}$$

Where:

max = maximum tension  
F = pulling force applied to the part  
l = length

A = section area and modulus of elasticity.

This look at the strength of the material allows the best use of the physical properties of the system since factors such as deflection of beams, the mechanical characteristics of the component, the cab, the counterweights, the reduction box, the cables, and pulleys, are components which must be properly dimensioned and adjusted to receive the commands and allow the system to respond satisfactorily. The action of automation requires that the physical system is aligned to operate consistently, making the fundamentals of science valid for the execution of operating a device that requires alignment and safety, in the case of the elevator all care must be taken so that, in operation does not happen disturbances that endanger the user's life.

## MATERIAL AND METHODS

For the formulation of the works of implantation of an elevator, the rules that guarantee reliability in the application of the device must be observed, choosing a methodology that allows to reconcile the formulations to the proposed objective, focusing on the rules that govern the system, thus, following the specifications stands out (CHAGAS, 2019, page 17):

- )] NBR 12892: 2009 (BRAZILIAN ASSOCIATION OF TECHNICAL STANDARDS, 2009) called single-family elevators or for use restricted to people with reduced mobility, it is the main standard pertinent to residential elevators, so it will conduct a good part of the work, it defines requirements for construction, installation and safety of residential elevators or for use restricted to people with reduced mobility embracing the main elaborations for the machine compartment, counterweight, car and doors, safety brake, suspension, speed limiter.
- )] NBR 16042: 2012 Safety requirement for construction and installation (BRAZILIAN ASSOCIATION OF TECHNICAL STANDARDS, 2012) Refers to safety requirements for the construction and installation of passenger elevators without engine rooms. This standard provides the main safety requirements and design parameters for construction and installation of elevators without machine rooms.
- )] NBR NM 207: 1999 Electric passenger elevators the standard NBR NM 207 (BRAZILIAN ASSOCIATION OF TECHNICAL

STANDARDS, 1999) deals with electric passenger elevators - safety requirements for construction and installation. The standard states that periodic inspections and tests on the elevators need to be carried out to make sure that the elevator is in absolute working condition. However, NBR NM 207 (1999) reinforces that regular tests should not be carried out with much constancy, since they can cause excessive wear or force stresses that may shorten the safety of the elevator, as in the case of the safety brake and bumpers. . These tests must be carried out with an empty cab in order to avoid accidents with third parties and the technician responsible for maintenance.

- J) NBR 8800: 2008 Steel and mixed structures (BRAZILIAN ASSOCIATION OF TECHNICAL STANDARDS, 2008) Design of steel structures and mixed structures of steel and concrete in buildings. This standard, based on the method of limit states, determines the basic requirements that must be met in the design at room temperature of steel structures, mixed steel structures and building concrete in which steel profiles are laminated, welded or seamless tubular section or with connections made with welds or screws.

This set of standards makes it necessary to meet your requirements for quality assurance of the device and, according to the Federal Accessibility Law, the technical standards in force in accordance with Brazilian legislation in the buildings for private use number 10,098 of 2000 must be obeyed. where the following fragment stands out in Chapter V. "Art. 13. Buildings for private use in which the installation of elevators is mandatory must be constructed in compliance with the following minimum accessibility requirements:

- J) Accessible route that joins the housing units with the outside and the dependencies for common use.
- J) Accessible route that joins the building with the public road, buildings and attached services for common use and neighbouring buildings.
- J) Elevator car and respective entrance door accessible to people with disabilities or reduced mobility.

Art. 14. Buildings to be constructed with more than one floor in addition to the access floor, with the exception of single-family dwellings, and which are not required to install an elevator, must have technical and design specifications that facilitate the installation of a adapted elevator, with the other elements in common use of these buildings meeting the accessibility requirements". (TORRES, 2019, p. 24). The study is developed within a perspective of implantation of an integration device inside a residence in a community of Manaus, where a resident has movement limitations and I see the lack of accessibility he only frequents the bottom of the house and how it is in a low region receives humidity and this can cause damage to the health of the resident. The elaboration of the device must go through technical analysis following the specifications expressed in the planning whose adaptations must follow the rigorous quality test, however it must be planned from the choice of materials observing the resistance, design in appropriate software to simulate the operational conditions in 3D projects and tables for visualization of properties, so when delivering the project to the executor, the prosperity must be well clarified so that the implementation will not be of a dangerous order and also the condition of optimization of materials. The automation part must also be clogged and tested before being installed in the residence. To design the product, prioritize the following materials and their characterizations.

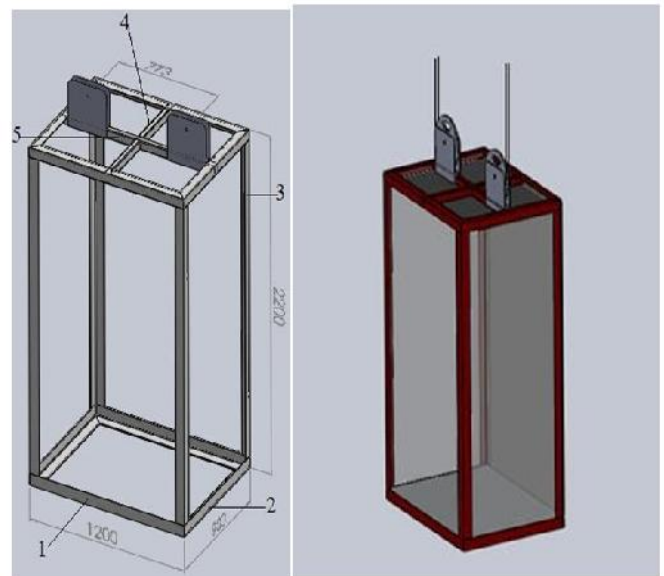
- J) Metal profiles in steel specified by the project.
- J) Professional welding.
- J) Equipment without parallax errors.
- J) Inspected before delivery to the customer ensuring quality.
- J) Standardize operators so that they perform the same functions during all stages of manufacture.
- J) The break times must be identical for the days of manufacture, being strictly equal for both beginning and ending mandatory breaks.

The gathering of tools for the construction of the physical system requires a lot of attention to the configuration parameters, this way of dimensioning materials and operational conditions are preponderant factors for enabling the systems to incorporate new interfaces, gaining intelligence and a lot of conformity to be updated in the current scenario.

## IDEALIZATION OF THE ELEVATOR PROJECT

For the formulation of the system, the structure for the construction of the elevator requires the search to adjust the bases, where the structural parts of the car must be numbered and following the normative specifications. These decision-making are important to prioritize the use of materials whose properties are properly defined and that their properties support the purpose for which they came. The quality of a service comes largely from the conditions under which it was performed and what mechanisms were used for improvement and implementation within a utility scale. The elevator project starts to gain stability when it is known the structure to be installed, the means of which will be inserted technologies that will automate the operational conditions, whose values can be applied for the social good.

The properties are calculated by relating the mass itself to the nominal mass multiplied by gravity, whose force is 5,105.56 N, when considering the mass of the support cables, dividing the force by 4, 1,276.39 N is obtained, balancing the forces to obtain an ideal diameter for the elevator operation. The dimensioning of the materials is important for the safety of the user, just as the dimensioning must follow a specific methodology, for this study follows the idea of Melconian (2009), whose interpretation of tables and a series of relevant data for the junction of the device, it should be noted that each application of lifting and transport machine there is a model of material, whose properties are capable of conferring the safety coefficient.

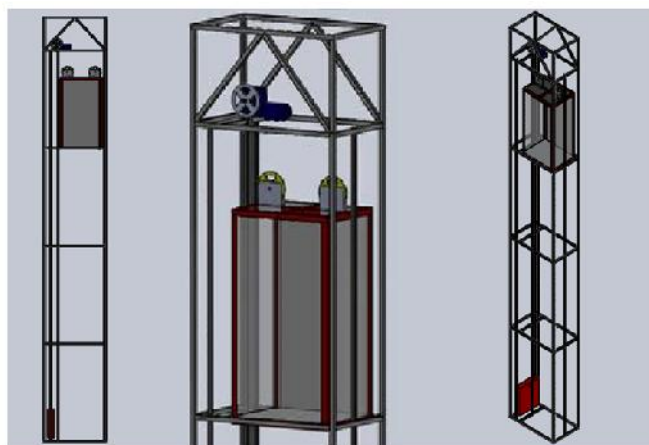


Source: Torres (2019)

Figure 02. Lift base structures

## ELEVATOR DESIGN LAYOUT

Once the characteristics and the proper dimensioning of the components have been determined, the layout of which has been forged based on the Brazilian Standard for the installation of a single-family elevator. After simulation in 3De the conditions of adaptation to the environment of the residence. Starting with the cabin structure, the beams that support the elevator are outlined, the number of structures required, with their dimensions and soliciting efforts, leads to a system as shown in figure 3.



Fyesterday: Torres (2019) adapted.

**Figure 3. 3D view of the elevator design**

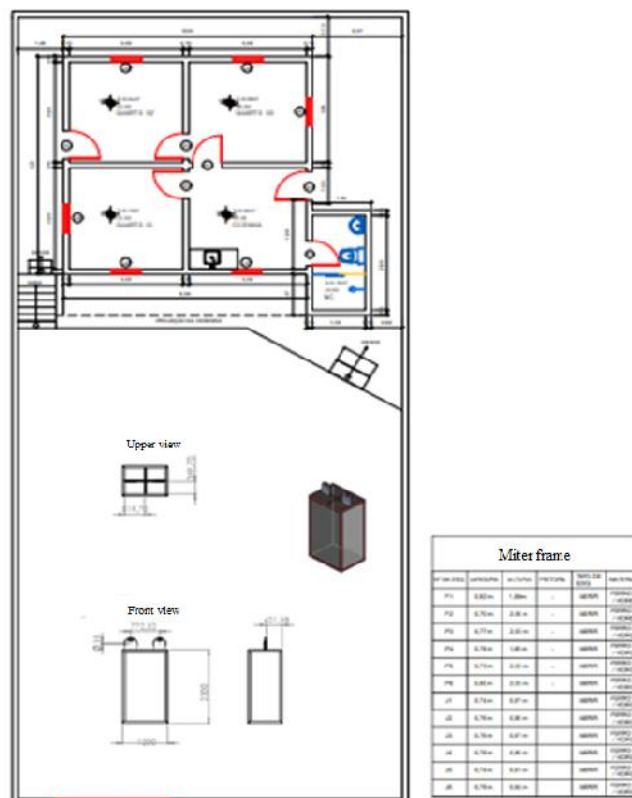
Emphasizing that the structure of the elevator is merely illustrative, as it simulates the system layout following a model with a bold feature and it is essential that a general scan is made in the details of the project to identify and correct the possible flaws that may be found. The main dimension of the cabin, of the cabin structure, stands out that the elevator project was modelled in 3D software and the dimensions that are not detailed can be acquired in the project model.

## RESULTS AND DISCUSSIONS

The residence has a very complex structure and requires that the adjustment process be done with a view to adapting the elevator to provide accessibility to the rooms on the upper floor of the house. This requires planning actions and arrangements so that the system will not cause any impact on the structure, structure and endanger the lives of residents. Do Nascimento (2019) describes that accessibility for the physically disabled has to be thought out and its construction obeying the Brazilian norm, with all the security apparatus, as these are made to transport people and people who have certain special needs. There is no secret in the way of activating accessibility, the need for which is noted by the incidence of people who depend on adaptations to move within the environments, whether they are public or private, the form of adaptation whether in bathrooms, stairs, elevators, in short, in any place where there is mobility of people should think about accessibility and promote equal conditions. Dos Santos (2019) highlights that there is a setback related to the rights of people with disabilities, since their rights should already be a priority for the implementation of public policies to allow accessibility for disabled people, the social inclusion policy is it deals with a government concession for the rights to be guaranteed. Figure 4 highlights the plan of the residence with the projection of the elevator that tends to connect the pavilions of the residence.

Monfrini (2019) highlights that the structuring of a floor plan has a mixed character, which makes it possible to bring together various strands of knowledge to subsidize different ways of adapting environments with adequate mobility. The right to move within the living spaces or any urban space requires that changes be studied and implemented to facilitate the movement of people. According to Bernardes (2011) apud Torres (2019). "The Convention on the Rights of Persons with Disabilities, the elimination of obstacles and barriers to accessibility, enables people with disabilities to live independently and participate fully in the various areas of existence".

Therefore, there must be collection and especially the effective presence of public managers, as well as a way to follow the need of this minority in the face of the withdrawal of objects that hinder the independence of coming and going without being hindered, as it is necessary as citizens to claim their rights. greater needs regarding access to social inclusion policies.



Source: Own (2020) adapted

**Figure 4. Plan of the residence with the projection of the single-family elevator**

According to the Statute of the Person with Disabilities in its art. 3<sup>o</sup> for the purposes of applying this Law, the following are considered: I -accessibility: possibility and condition of reach for safe, autonomous use of spaces, furniture, urban equipment, buildings, transport, information and communication, including their systems and technologies, as well as other services and facilities open to the public, of public or private use for collective use, both in urban and rural areas, by persons with disabilities or with reduced mobility". (DOS SANTOS, 2019. Pag. 4). The floor plan must be in line with the execution report of the work, in the case of the house that was taken as the basis for this study, it refers to a house whose facilities, under no circumstances met the requirement of accessibility, with this circumstance a disabled resident stayed in a certain environment in the house and this impacts their physical and mental health. Vinagre (2016) highlights that the population, as they get older, requires new forms of accessibility, since the elderly must be independent, they must seek their ability to move around without needing help from third parties, the floor plan of the building is made important for the insertion of innovations, which allows the visualization of the system still in project and this allows to adjust the points to ensure quality. The ways of allowing the population that suffers from a lack of infrastructure, if it is already significant in public spaces, imagine it in homes, where construction is done impromptu, and accessibility conditions are almost never contemplated, which opens a warns about the search to trigger studies that highlight the way of life of the disabled, to know if they are in suitable environments for mobility or what are the challenges that most imply for them to do their activities with autonomy and safety.

Nowaczyki (2018) uses home automation for demonstration in the classroom and explains how to automate a home in complete safety, using electronic equipment, lighting, air conditioning and mobility devices are essential to be activated by intelligent and innovative systems. Automation requires the enhancement of the structure available to make it autonomous and triggered by signaling devices, if it is important to work on automation and for homes where a disabled person lives, that residence needs specific signs and aimed at promoting the inhabitants' autonomy, in this case of the elevator,

target of this work, the sensor system must be implemented to subsidize autonomy for the disabled, giving him autonomy and satisfaction in being able to perform a task without necessarily needing a third party. Fudoli (2017) highlights that the available home automation technologies and the development of a wireless sensor network project applied the home automation and internet of things satisfying commands and monitoring, some of the resources of home automation in a resilience of interest to cause corrective effect on mobility and access problems. The main home automation technologies available and the development of the design of a wireless sensor network applied to home automation and the internet of things, you can use the Arduino platform, based on studies by Júnior (2018); Quijije (2016); Sanclemente (2016); Rolim (2019), expresses that it is possible to implement a network capable of obtaining data from an environment through humidity, temperature and light sensors, as well as making them available for consultation via the Web through the Thing Speak platform and also taking actions based on the values of these Dice. The structure of the system's automation capacity depends on which technology is available to support a diversity of options during the process. The implemented wireless sensor network can consist of n sensors, which are enabled to take the humidity and temperature readings, another one that reads the ambient light and the last one makes a trigger, based on one of these readings. The gateway of this network receives the data from the nodes, interprets them and makes them available in the cloud, through the Thing Speak platform. The prototype of this gateway was implemented on a printed circuit board. Thus, there is a very large diversity of possibilities that graft the punishment of all the elements that can subsidize improvements in the application.

## CONCLUSION

Home automation can make a difference in the life of a person who has limitations within an unstructured environment, as it makes it possible to link sectors that are disconnected due to lack of attachment in the implementation project or even the absence of structured knowledge to improve the life of the deficient. Among the objectives outlined in the development of this study, it was possible to verify the economic and structural feasibility of implementing a home elevator for the mobility of the physically disabled. The proposal highlighted the automation of an elevator to interconnect the floors of the house, as it is a two-storey residence, the spiral stairs do not allow the disabled access to the second floor, leaving them vulnerable and confined to a room and when it had to be moved, it would have to be carried and so with great difficulty. Because it is a study that tends to design a device with Home Automation, whose Adaptation Project at Casa de Manaus for the physically disabled with mobility difficulties a survey was made of the properties of home automation, the criteria of health and well-being of the patient, as well as the adaptive characteristics of the residence for locomotion independently. What was expected with this study was the vaporization of the principles of automation to facilitate the movement of a resident within his own residence, thus facilitating his access with autonomy and a certain degree of freedom. From an engineering perspective, promoting safe mobility between the two floors of a residence proved to be challenging for planning and simulating particularities. The project encompasses knowledge from the technology area that discusses the standards for implementing elevators based on models operating in the market, equipment sectors and their functionality. In this context, some theories of strength of materials and mathematical notions were approached as a vehicle that facilitates solutions, and also discussed knowledge about the functionality of automated devices and notions about sensors. To take advantage of ABNT standards, the construction of the idea and the device whose factors value the search for problem solving, thus, support the construction and installation of elevators so that they are designed and safe. The study carried out on the dimensioning of the elevator to speed up the resident's mobility proved to be relevant because it creates an expectation of challenge to bring well-being and convenience due to the availability of application-oriented technologies.

The reference on the qualification of the material and the availability of conditions for the use of home automation to generate autonomy within the residence to promote the well-being and mobility of the resident, the idea of promoting the intertwining of science to bring solutions to problems that drag on and which they need to be impacted, it is worth asking how many people live in unsanitary conditions, whose home is an environment like a prison that confines them to a condition that leads them to comorbidities and diseases caused by the lack of infrastructure.

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