DEVELOPMENT AND TESTING OF 8 CHANNEL RF REMOTE CONTROL FOR HEMIPLEGIA AND EXPRESSIVE APHASIA CONDITION PATIENTS

ARAVINTHA RAM A/L SUPPIAH

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Politeknik Sultan Salahuddin Abdul Aziz Shah

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ENDORSEMENT

"I hereby acknowledge that I have read this report and I find that its contents meet the requirements in terms of scope and quality for the award of the Degree in Electronic Engineering (Medical)''

Signature : .....

Name of supervisor: .....

Date : .....

DECLARATION

"We hereby declare that the work in this report is our own except for quotation and summaries which have been duly acknowledge"

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Date : .....

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ABSTRACT

Hemiplegia and aphasia is one of the effects due to stroke that happen to almost every stroke survivors. Most of them will have a speech disorder due to brain injury and one side of their body can't function well. These patients remain largely dependent on caregivers for all daily functions including leisure occupation and communication. Any effort to help them acquire some levels of independent functioning requires the support of specific technology. There are few products have been developed and already in market but it can't afford by middle class. Furthermore, the functions are not mainly for helping but to entertain the bored half-paralyzed and expressive aphasia person. To cater this problem, this study focuses on development of eight (8) channels RF remote controller device based on their needs and improved by increasing the number of functions, developed with a low cost. RF remote control is functioning with a 12VDC, is appropriate compared to Bluetooth and infrared systems. It also equips with four (4) latch buttons of the device control fan speed 1 & 3, panic button, off both panic button and fan. This device comes with four (4) momentary buttons which is yes option with led indication, recorded voice note, light dimmer, and GSM modem. Apart from this option, patients can select their desired function and it can be connected to the relay. The device testing was conducted in term of robustness of the device, safety factors such as current flow and the design itself. According to medical students this device is helpful for the patients and their care takers.

(Keywords: Hemiplegia, Aphasia, RF remote control, Bluetooth, Buttons)

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CHAPTER 1

INTRODUCTION

1.1 Introduction

In this chapter briefly discussed about 2 major types of condition caused by stroke which is hemiplegia and expressive aphasia. Patients with this condition face a lot of problems in carry out their activities of their daily life. Eight channel radio frequency (RF) remote control and GSM can be helpful for those patients.

1.1.1 Hemiplegia

Hemiplegia is defined as paralysis on one side of the body caused by brain damage. Primary cause is a stroke, although a traumatic injury or brain tumor may also cause hemiplegia. Person may have problems with balance that increase the risk of falling. According to National Stroke association USA, about one in every 1,000 children has hemiplegia [1]. In the majority of cases the damage to the brain happens before, during or soon after birth, when it is known as congenital hemiplegia.

Some children however, develop hemiplegia after a stroke (when a bleed or a blood clot damages part of the brain), an accident, a brain infection or tumor. This is called acquired hemiplegia. Some people develop hemiplegia in adulthood, following illnesses such as a stroke, accident, infection or tumor.

Hemiplegia affects everyone differently but its most obvious result is a varying degree of weakness and lack of control in one side of the body (rather like someone who has had a stroke). Some children are only mildly affected, others more seriously. In some, the leg is more badly affected than the arm, in others it is the arm which is more seriously affected. But in a majority of children, the damage to their brain affects more than their limbs and movement. Specific learning difficulties such as dyslexia, perceptual and concentration problems are common, as are emotional and behavior problems. Other than that hemiplegia can also cause medical problems such as visual impairment, speech difficulties and epilepsy.

Hemiplegia is a permanent condition, so it will not go away and it cannot be cured. But it is also non-progressive, which means it will not get any worse, and with help, its effects may be reduced. When a child is diagnosed with hemiplegia, they are usually referred to a child development center, often within a local hospital. Here, different therapists work with the child to lessen the effects of the condition, strengthen the weakened side of the body and develop the skills of the individual.

1.1.2 Expressive aphasia

Expressive aphasia (Broca's aphasia) is non-fluent form of aphasia where individuals have the ability to read and understand spoken language, but possess a limited ability to produce speech. It often takes great effort for these individuals to produce speech. People with broca's aphasia have damage to the frontal lobe of the brain. Individuals who have broca's aphasia may experience some or all of the following problems such as, have difficulty putting words together into complete sentences. Instead, communication is made by using single words or gestures that resemble, difficulty repeating words or sentences, difficulty spelling, forming letters and words, and cannot write within the lines, May leave out words like "is" or "the" when speaking, respond to others with nonsensical statements that don't pertain to the conversation, might use a word that is close to what they intend, but not exact and a vocabulary that is below normal.

Treatment for aphasia is individualized to address the specific areas of concern for the person. In some cases, a person will make a full recovery from aphasia without treatment. For most cases, language recovery is not as quick or as complete and treatment is necessary.

Research has shown that effective treatment for aphasia is assessed based on four important criteria, amount of treatment, type of treatment, severity of aphasia, and type of aphasia. The goal of aphasia treatment is to help restore language abilities or teach compensatory strategies for language impairment to help improve communication [2].

Aphasia is usually caused by a stroke or brain injury with damage to one or more parts of the brain that deal with language. According to the National Aphasia Association, about 25% to 40% of people who survive a stroke get aphasia [3]. Aphasia may also be caused by a tumour, brain infection, or dementia such as Alzheimer's disease. In some cases, aphasia is a symptom of epilepsy or other neurological disorder. Expressive aphasia (non-fluent), with expressive aphasia, the person knows what he or she wants to

say, yet has difficulty communicating it to others. It doesn't matter whether the person is trying to say or write what he or she is trying to communicate.

1.1.3 Activities of daily living (ADL)

Activities of daily living (ADL) are routine activities that people tend do every day without needing assistance. There are six basic ADLs: eating, bathing, dressing, toileting, transferring (walking) and continence. An individual's ability to perform ADLs is important for determining what type of long-term care (e.g. nursing-home care or home care) the individual needs. The type of six basic activities of daily living is shown in the figure 1.1 below.

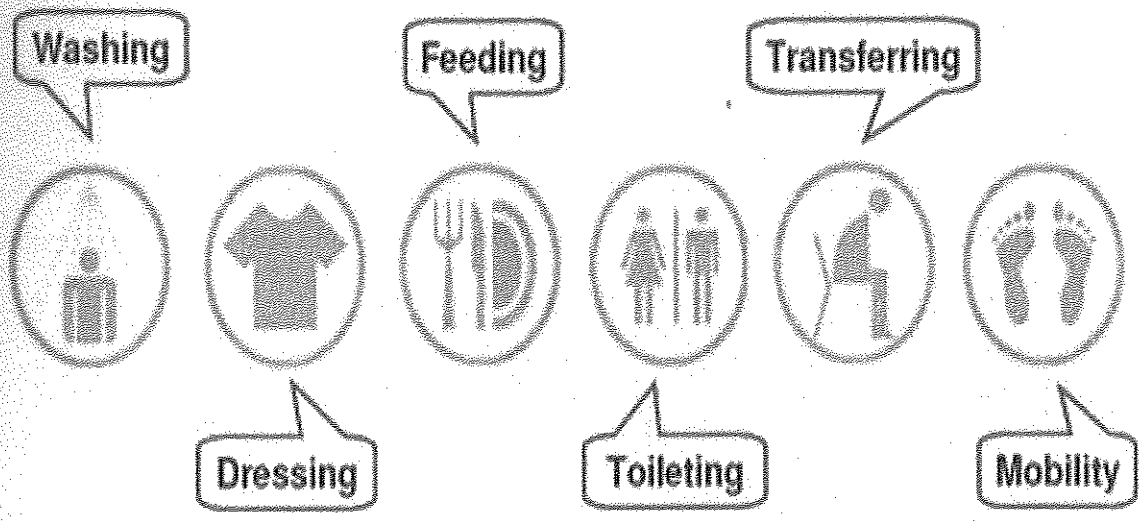


Figure 1.1 Activities of daily living

1.1.3.1 Activities of daily life for Hemiplegia patients

Those half paralyzed patients have some difficulties in term of handling instruments, education/work, play/leisure, social participation, sensorimotor, cognitive, and psychosocial. Most of their difficulties is because of their half paralyzed body movement in excessive tiredness.

1.1.3.1.1 Activities of Daily Living (Instrumental ADL)

Patients with hemiplegia having trouble in performing Instrumental ADL .Person may have difficulty performing ADLs that typically are performed by both hand (bilaterally), such as cutting food, grooming, toileting, bathing, and dressing [4].They may have difficulty performing ADL tasks that are typically performed by the dominant hand and arm if that side of the body is involved, such as eating, brushing teeth, and combing hair. Apart from it, difficulty performing IADLs that are typically performed by both hands and arms, such as meal preparation, laundry, cleaning, opening mail, driving, pushing a shopping cart, and paying for purchases with cash or credit/debit card. Person may have difficulty performing IADLs that are typically performed by the dominant hand if that hand is involved, such as writing, using a key to open a door.

1.1.3.1.2 Education/Work

Person may have difficulty performing work-related activities that are typically performed bilaterally, such as keyboarding and performing work-related activities that are typically performed by one hand, such as holding or dial the phone.

1.1.3.1.3 Play/Leisure

Person may have difficulty performing leisure activities that are typically performed bilaterally, such as playing card games, playing golf, knitting, and embroidering. Other than that they also have difficulty performing leisure activities that are typically performed using one hand, such as throwing darts and doing crossword puzzles.

1.1.3.1.4 Social Participation

Person may have difficulty participating in activities he/she formerly enjoyed due to changes in sensorimotor, cognitive, or psychosocial capacities.

1.1.3.1.5 Sensorimotor

Person may lose, or experience decreased use of, one side of the body or one upper extremity. They may experience shoulder pain during shoulder movement in flexion and abduction due to subluxation, abnormal muscle tone, limitations in shoulder range of motion, capsular contractures, adhesive capsulitis, rotator cuff ear, brachial plexus injury, shoulder–hand syndrome, or pre-existing conditions. Person's scapula may pull into retraction and downward rotation, with internal rotation and adduction of the arm and elbow flexion, and with minimal or no movement at the wrist and fingers.

1.1.3.1.6 Cognitive

Person may lose or experience decreased use of cognitive skills, such as attention, learning, memory, and executive functioning.

1.1.3.1.7 Psychosocial

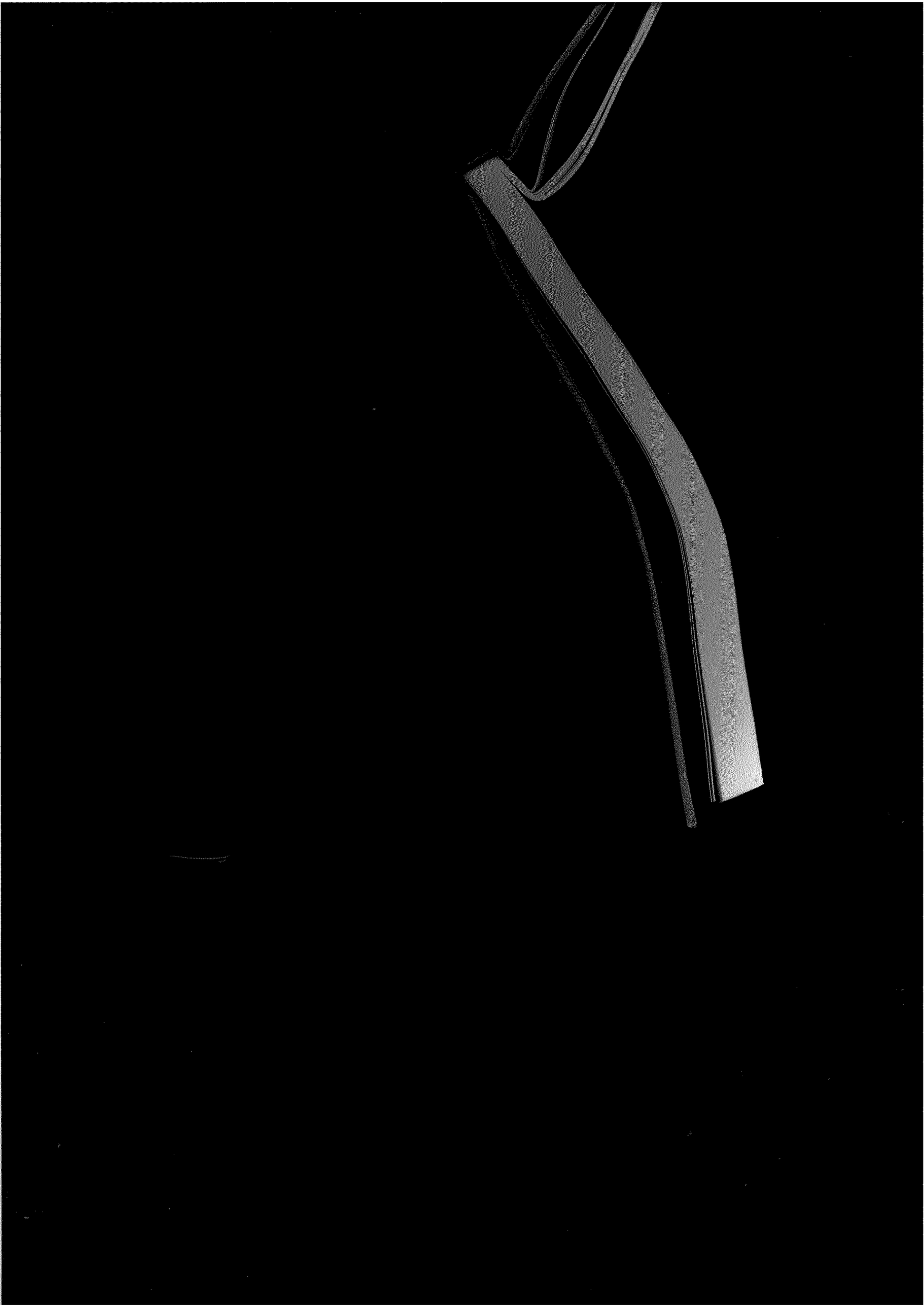
Person may experience depression, anxiety, or loss of interest.

1.1.3.2 Activities of daily life for Expressive aphasia patients

Not being able to express yourself clearly when you want to can be very isolating. It is not unusual for people with aphasia to feel depressed and frustrated, especially if they can no longer participate in the activities they used to enjoy. It can also be very tiring, as trying to communicate may require a lot of effort.

1.1.3.2.1 Helping someone with aphasia to understand you

Keep your own language clear and simple. Speak in a normal tone of voice. Don't rush the conversation. Give the person time to take in what you say and to



respond. Assume the person can hear and understand well, in spite of any difficulties responding, unless you learn otherwise. Stick to one topic at a time using short sentences. For example, instead of saying, "Your wife called and she will be here at 4pm to pick you up and take you home", say: "Your wife called." (Pause) "She will be here at 4pm." (Pause) "You can go home then." Use all forms of communication to help reinforce what you are saying, such as clear gestures, drawing and communication aids. Use adult language and don't 'talk down' to the person with aphasia. Even if someone understands little or nothing, remember they are not a child.

1.1.3.2.2 Speech Therapy for expressive aphasia

Speech therapy, provided by a speech pathologist, helps a person improve his or her ability to communicate; this includes speech, which is how sounds are made, and language, which involves understanding and choosing the correct word to use.

Stroke that occurs on the left side of the brain can affect speech and language abilities, as well as movement on the right side of the body. The main goal of speech therapy is to restore the stroke survivor's ability to communicate accurately, by treating the following areas like helping stroke survivor with speech problems has difficulty producing sounds so that others can understand him or her. Language is the use of symbols, such as words, numbers of gestures that have meaning. A stroke survivor may have trouble understanding or correctly choosing words or numbers or gestures. Cognition or thinking skills -in order to communicate accurately with others, a stroke survivor must be able to pay attention, concentrate and use various thinking skills. A stroke survivor may have difficulty controlling tongue and swallowing. The muscles in the tongue and throat are the same ones used in making sounds. Therefore, therapy that helps speech can also help swallowing.

1.2 Problem statement

Hemiplegia patients are facing problems with movement and balance. Many people experience muscle weakness or paralysis after a stroke, which can affect your mobility and balance. This usually happens on one side of your body and can also cause a lot of pain and discomfort. They will feel excessive tiredness too.

Meanwhile patients with expressive aphasia can have great difficulty forming complete sentences. They can read and understand a sentence but it's hard for them to express their thought. This made them frustrated while convey message to someone. Things become worst in case of emergency.

Both their needs can solve by development of 8 channel RF remote control. It cost less with multi-functions which is really reducing their problems. This project will be able to help the patient to be independent and boost confidence level.

1.3 Objective

The main objective of this study is to develop eight channels RF remote control. In order to achieve the main objective, the sub-objectives are as follows:

- To design eight channels RF remote control.
- To test the eight channels RF remote control.
- To validate eight channels RF remote control devices to hemiplegia and expressive aphasia patients to carry out their activities of daily life (ADL) without depends on anyone.

1.4 Scope of project

This device is made for hemiplegia and expressive aphasia condition patients. Eight channel RF remote control, GSM are used. It was programmed using MPLAB IDE v 8.85 and Micro C PRO v6.0. The device then tested in lab for the safety and quality purpose.

1.5 Importance of Research

The project is mainly to help with activities of daily life for patients after stroke. By doing this the patients can gain more confidence. The research also help to detect the safety element needed by patients with this condition and developed the RF technology to help them.

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