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## Design and Manufacture Electronic Scales for Adult Patients

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Abstract: Our paper is focus on measuring the weight of patients who have difficulty in moving or lose moving ability. Our device provides basic functionalities: measuring the weight of the patient, print the weight of the patient with the time when the patient is weighed. Our device can also keep information of five latest patients including the weight and the time when the patient is weighed. I hope device my electronic scales for adult patients will replace to electronic scales are being used in hospitals in Vietnam which are imported from countries with high prices, difficulties in maintenance, repair and replacement of electronic components.

Keywords: patient weight, electronic scales, automatic print, adult patients.

#### 1. Introduction

At present, our country's health sector as well as the world is faced with no small challenge for the new condition growing, the Complications of this pathology is increasingly complex, requiring medical team physicians should have a high level of expertise, we always update with new regimens that world as well as Vietnam has researched and tested successfully completed the regimen of treatment is always a process control strict control and monitor clinical status of the patient to be able to adjust the treatment regimen was more effective. Therefore, with the modernization of medical equipment systems in hospitals today are essential and are the subject of much attention and industry authorities in both countries. The traditional medical equipment simply cannot meet the progressively domestic demand and cannot keep up with the development of medicine in the world. Bach Mai Hospital is a hospital in the special category of leading Central, a place to receive hundreds of thousands of patients each day. The number of patients treated in hospitals are located in overload. Therefore, the modernization of medical equipment systems in hospitals is always a top priority.

Weighing scales is a measuring instrument for determining the weight or mass of an object. Weighing scales are used in many industrial and commercial applications, and products from feathers to loaded tractor-trailers are sold by weight. Specialized medical scales including infant medical scales, and bathroom scales are used to measure the body weight of human beings. An analytical balance is a class of balance designed to measure small mass in the sub-milligram range. The measuring pan of an analytical balance (0.1 mg or better) is inside a transparent enclosure with doors so that dust does not collect and so any air currents in the room do not affect the balance's operation. This enclosure is often called a draft shield. The use of a mechanically vented balance safety enclosure, which has uniquely designed acrylic airfoils, allows a smooth turbulence-free airflow that prevents balance fluctuation and the measure of mass down to 1  $\mu$ g without fluctuations or loss of product. Also, the sample must be at room temperature to prevent natural convection from forming air currents inside the enclosure from causing an error in reading. Single pan mechanical substitution balance maintains consistent response throughout the useful capacity is achieved by maintaining a constant load on the balance beam, thus the fulcrum, by subtracting mass on the same side of the beam to which the sample is added.

Electronic analytical scales measure the force needed to counter the mass being measured rather than using actual masses. As such they must have calibration adjustments made to compensate for gravitational differences [1]. They use an electromagnet to generate a force to counter the sample being measured and outputs the result by measuring the force needed to achieve balance. Such measurement device is called electromagnetic force restoration sensor.

#### 2. Methods

#### 2.1 Body paragraphs

The Evans function E, introduced in the beginning of 1970-s in a series of seminal papers by J. Evans [2], [3] has since became one of the sharper tools in the arsenal of a mathematical physicist [4], [5]. The interest that Evans function generates is dictated by its very specific properties: defined as a function of spectral parameter for some differential equation problem, the zeroes of Evans function correspond uniquely to the eigenvalues of this problem. Of course, such a property makes one wonder whether the Evans function can in at least some cases be represented as a polynomial over the spectral parameter  $\lambda$ . In fact, those special cases for which it was possible to do all the necessary calculations has shown this proposition to be correct. Unfortunately, the general case has proven too difficult to tackle by ordinary means.

In this article we'll try a different approach; instead of trying to simplify the Evans function by itself, we'll try to establish the relationship between the Evans functions of two problems, possessing exactly the same spectrum with one exception: one single point  $\lambda_s$  belonging to spectrum of the first problem would be altogether expunged from the spectrum of the second problem. It will be shown that the corresponding Evans functions would indeed differ by the factor of  $(\gamma - \kappa)$ , where  $\lambda = -\gamma^2$  and  $\lambda_s = -\kappa$ . The key to success lies in the Darboux transformation [6].

#### 2.2 Yang–Baxter equation

In physics, the Yang–Baxter equation (or star-triangle relation) is a consistency equation which was first introduced in the field of statistical mechanics. It depends on the idea that in some scattering situations, particles may preserve their momentum while changing their quantum internal states. It states that a matrix R, acting on two out of three objects, satisfies. In one dimensional quantum systems, R is the scattering matrix and if it satisfies the Yang–Baxter equation then the system is integrable. The Yang–Baxter equation also shows up when discussing knot theory and the braid groups where R corresponds to swapping two strands. Since one can swap three strands two different ways, the Yang–Baxter equation enforces that both paths are the same.[7]

# **3.** Design and manufacture electronic scales for adult patients

## 3.1 Design Requirements

After learning about the device is used in Bach Mai hospital and survey the actual requirements of the Academy of Sciences Center in Bach Mai hospital room, consult edit, change of function, way use, they put out requests for product design as follows:

**Provide information and time:** It provides functions such as patient data, time balance information, and patient weight. Include the following information: date, month, year, and hour, minute. To ensure accurate time clock timer device must correspond with the actual clock, independent operation, timer continuously even if the device is not powered. In addition, the device must provide custom functionality for the time value convenient to use.

*Display and user interface*: Weight display information visually. Also need to show real-time information to the user can install real-time information, dates.

Accurate measurement of patient weight: Equipment function is measured through patient weight 2 pylons. The system uses two sensors placed opposite each other, the weight is measured as the sum of two sensors, namely the two load-cell, according to the general principles of synergy. Weight is measured from 0 degrees to 100 kilogram, gram resolution 100, the error does not exceed 1%.

Weight (kg)	Volume (ml)	Frequency (per minus)
2	16-20	30
3	24-30	25
10	80-100	20
20	150-200	18
30	240-300	16
40	320-300	14
50	400-500	12
60	480-500	10
70	560-700	10

**Table 1:** Weight - volume – frequency relational table.

**Data Storage patient information 5 most recent measurements:** Device automatically stores patient information 5 most recent use. Information stored includes: measured weight and balance time, stored data even when there is no power supply for the device. This is a new feature compared with the current device is added at the request of the Academy of Sciences Center of Bach Mai hospital room.

**Print patient information data upon request**: It provides printing functions in place of the patient data are measured or existing patient information stored in the device. Printed information including measured weight of the patient and time scales.

*Other Requirements:* Anatomy of price mechanical balance for sure, there is no phenomenon falls, flip patient during the balance. Stable operating system in the hospital environment, easily replaceable parts if something goes wrong. Layout by Vietnamese, friendly, easy to use. Weight information, the time is displayed loud, clear, easy to see. Use two power supplies - one way or battery power to ensure people's mobile devices.

## 3.2 Design Schematic

We are in demand for offering optimum quality electronic scales for adult patients. Our system is widely used in medical designing industry and in medical stores for accurate measurement of very less quantities. These Precision scales are designed with perfection to offer highly accurate results. Hardware structure is built on the microcontroller device stability. The circuit was designed and tested in accordance with medical standards of the Ministry of Health, Vietnam. We also simulate the operation of the device and assess the damage can occur.

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Figure 1: The schematic of electronic scales for adult patients

#### 3.3 The mechanical design

After design the controller for the device, we conduct drawings mechanical design of the weight closer to weighing patients in bed is used in Bach Mai Hospital. The load cell is customize for widely use, it not depend on the shape, structure in Bach Mai hospitals.





We also redesigned the rack mount system with load cell ensuring aesthetic and safety techniques while balancing patient as well as the weight moves.



Figure 3: The body of the device on complete balance

## 4. Results

The device is fabricated research. The process for testing active devices to achieve good results. The figure 4 below describes the stability of the device to change the patient's weight. However, some devices also limited as Interface with the user interface is not friendly design uses 2 power supply circuit is not optimized, mechanical part design accuracy is not high. International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064

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We will continue to improve the interface with the user interface, and battery charging circuit design using the adapter, component mechanical design to achieve high precision, achieving aesthetic techniques in use. Besides, we will store patient data into the computer by wireless communication.

## 5. Conclusions

We had complete design of mechanical components and control circuits fulfill the function. The device's balance is stable performance, measured values of patient weight exactly to specifications given. We also have some backup circuit for testing and replacement while the circuit's weighbridge controller at the hospital is in trouble. Process transparency test at the hospital tomorrow to see devices achieve high precision stable, ready to be put to use in the future in Vietnam

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