Design and Implementation of an Electronic Board for Building Access Control

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Course: Análisis y Diseño de Circuitos Digitales (MT-127)

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SUMMARY

In the manufacturing processes of electronic cards for access to intelligent buildings people it does not have adequate control and standardized for cards produced quality. In this report the procedure that will be held for the design and implementation of proposed quality control electronic punch cards that must store and transmit information described prototype. Combinational circuits, Sequential Circuits, Memory, decoders, etc.: To do the knowledge acquired in the course on topics such as Digital Circuit.

INTRODUCTION

Punch cards are sheets made of some kind of material used to manage information in the form of holes that fit a binary code that can be handled most efficiently. It is important analysis and application as they were the first means used to enter information and instructions to a computer in the early 60 models.

Punched cards were first used by Jean Baptiste Falcon shaped punched paper rolls used in controlling textile looms in France. This technique was greatly improved by Joseph Marie Jacquard (Fig. 1) also applied in the textile industry (Fig. 2).

Fig. 1: Joseph Marie Jacquard

Fig. 2: Punch cards on a Jacquard loom

IBM has manufactured and marketed a variety of *machines registration units* to create, organize, and tabular punch cards, even after expanding into computers on the end of the 50s.

IBM developed the technology of the perforated as a powerful tool for business data processing card and produced an extensive line of *machines units* general purpose *register*.

By 1950, the (Fig. 3) IBM cards and IBM *machines units' registration* had become indispensable in industry and government.
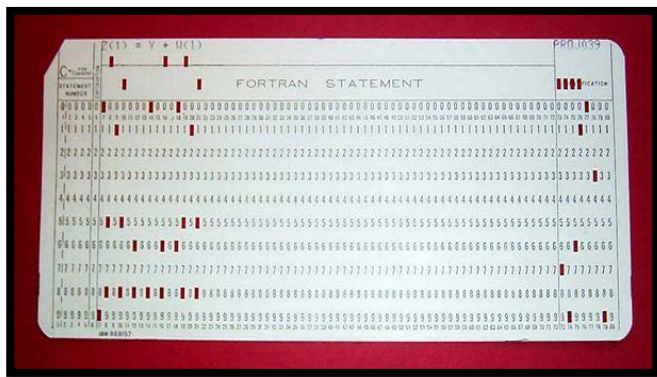

Fig. 3: BM punch cards

Making a punch card passes through different processes until you reach your final finish. The main stages are design, reproduction and printing and finished (Fig. 4).
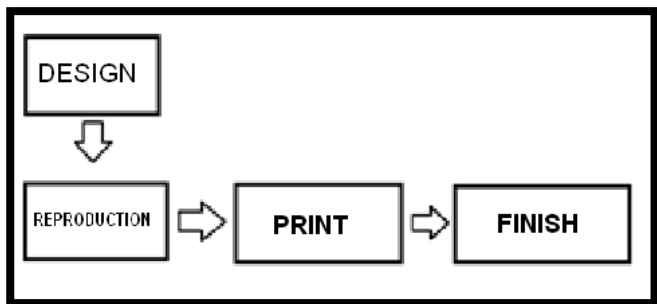

Fig. 4: Process for manufacturing the cards.

The design is made according to the specifications needed. Under these prerequisites physical and logical formats for information exchange are established.

Reproduction is aimed at development of necessary plates for manufacturing the card, while printing occurs to translate the characteristics of the card; these are determined by the design process.

And the final phase is completed in which the individual features are included on the pass, the main end processing we have: Fixing the magnetic stripe (Fig. 5), incorporating holograms or signature panels, laminates etc.
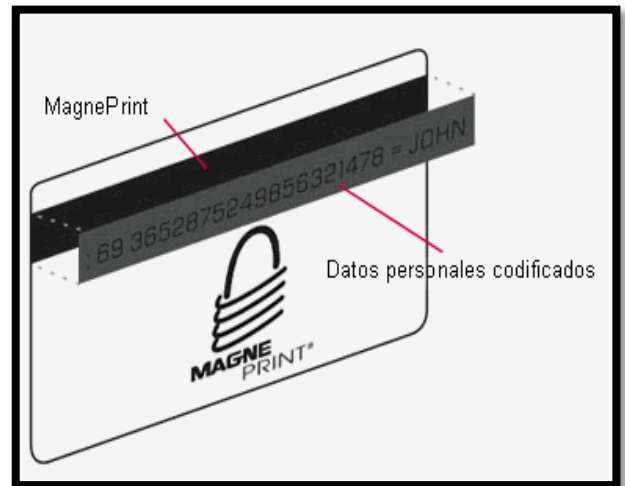

Fig. 5: Representation of a magnetic stripe

PRESENTATION OF THE PROBLEM

Currently there are industries that manufacture punch cards applied to control access to buildings, but do not have a quality control process standardized and appropriate as many cards that are discarded by poor production, increasing costs and forming process exists source of pollution because you cannot re-process the cards that have been badly made.

Following mentioned in the preceding paragraphs, it is desired to implement a prototype which can be used in quality control of the manufacturing process of punched cards in question.

This prototype will allow these cards, which process and store data, to be passed through a card reader (Fig. 6), showing the information contained in the form of letters in a display and also must follow a give operating or. That is, the letters must be read appear in order of the card.
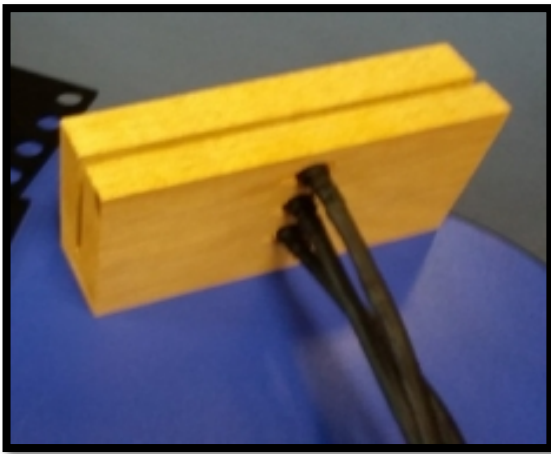
Fig. 6: card reader made of wood

To do so every punch card must represent a code, in this case will be binary, that must be decoded by the card reader and then passed to an efficient decoding display. Le each card will be perforated differently and varying the order to differentiate the other (Fig. 7).
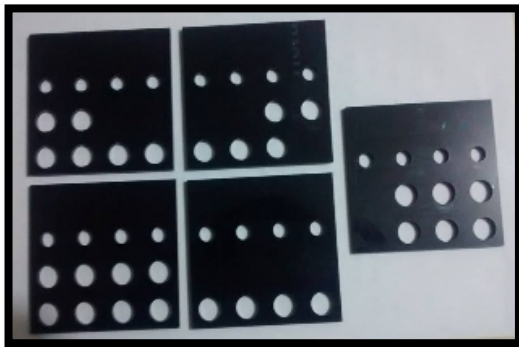

Fig. 7: punch cards.

Limitations have that information to be read only consist of three rows of bits of information, also the prototype is designed for cards Dimensions 5 cm X 9 cm (Fig.8).Another limitation is also where the result shown in the display has 16 segments as resolution.
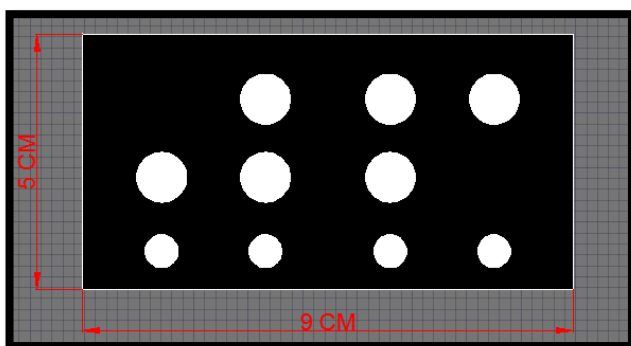

Fig. 8: Measures of the punch card.

OBJETIVES

General objetive:

- Implement a prototype of quality control of electronic cards for access control to buildings.

Specific objetives:

- Detail the logic and operation of each element to be used in the project.
- Explain the logic designed for moving data using the digital circuit simulation Proteus V.8.
- Good decode input (cards) to the outlet (displays) through implementation based combinational and sequential digital circuit solution.

DESCRIPTION OF THE SOLUTION

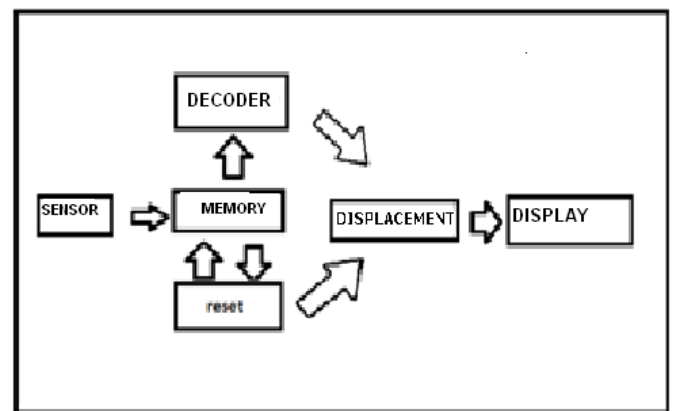Block diagram of the operation of the proposed circuit is shown. (Fig. 9)

Fig. 9: Functional diagram

Figure 10 corresponds to the flowchart corresponding to the pitch of information track of punched cards.
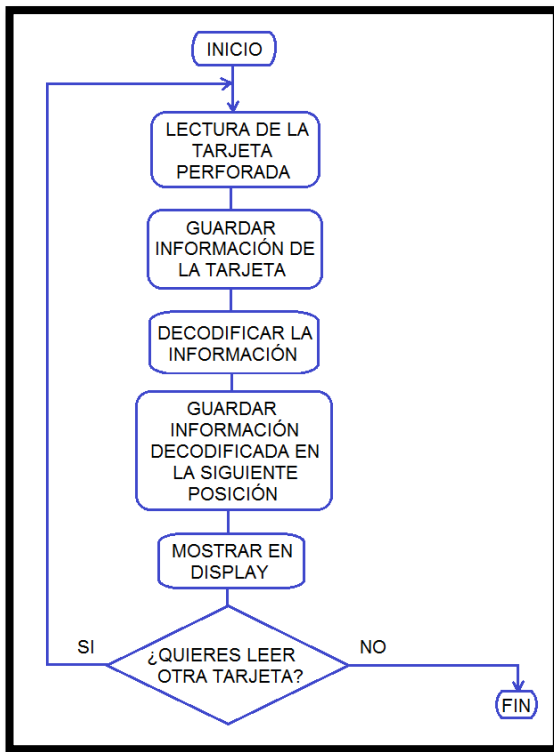
Fig. 10 flowchart circuit

For data read by the card reader CNY70 (Fig. 11) sensors, coupled to the reader, which is an analog type optical sensor which emit different levels of electrical signal depending on whether or not the reflecting surface was used the light.

Fig. 11: optical sensor CNY70

A limitation to the use of this sensor is that it forces the punch cards are colored black as it is the only way in which to obtain high-level signals to not reflect light.

And to solve the sequence of displays in order of what you read through the card reader, memory devices that will store the binary code of each card and go moving them to the next display you need every time you pass by the reader a new card.

It starts with the data pulses emitted light due to bouncing of cards by means of two sensors CNY70.

Because the data collected by the sensors are analog type, the pulses generated are very weak or low pollution for that reason it must use an analog-digital converter (integrated CD40106) so that the process is done in a better way (Fig. 12).
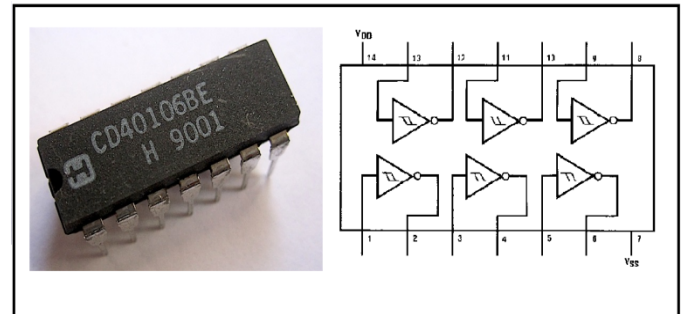

Fig. 12: External appearance and wiring diagram of the integrated circuit CD40106

Three led is added to check the correct reading and conversion of the pulses emitted from CNY70 sensors.

The pulses issued by the A / D is encoded in digital form (0 and 1 or HIGH AND LOW) and register or memory (74LS164) (Fig. 13) in order to use the data in the following step.
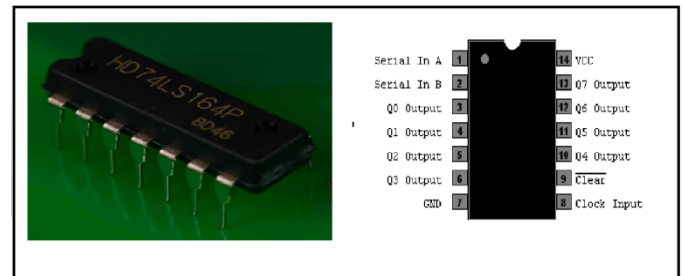

Fig. 13: External appearance and wiring diagram of the integrated circuit 74LS164

The first data obtained passed directly to the display of 16 segments, when a second data is read, the first data is shifted by a shift circuit to the next display (this is achieved since the memory stores the first data) and something happens analog with the following data read by the sensor.

To implement the shift circuit will be used Flip-flops called D (Fig. 14) these are the memory elements that best suit the need of the project as these are characterized by information stored indefinitely in the absence of disturbances (Fig . fifteen).
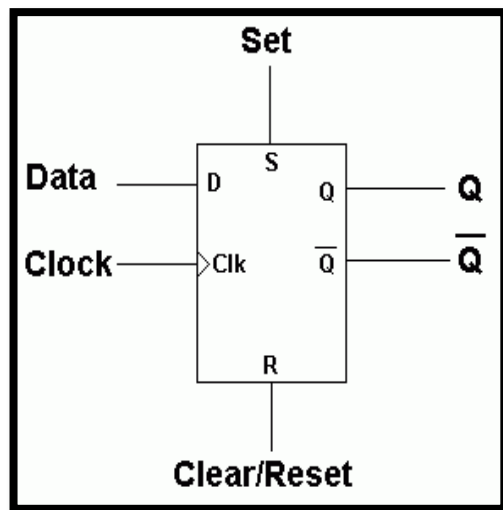
Fig. 14: Pines of a D Flip-flop

Fig. 15: truth table of the flip-flop D

Additionally by using logic gates (and or and not) used by integrated circuits 74LS04, 74ls08, 74ls032 (Fig. 16) the reset button empty all memory and movement to make new readings is created.
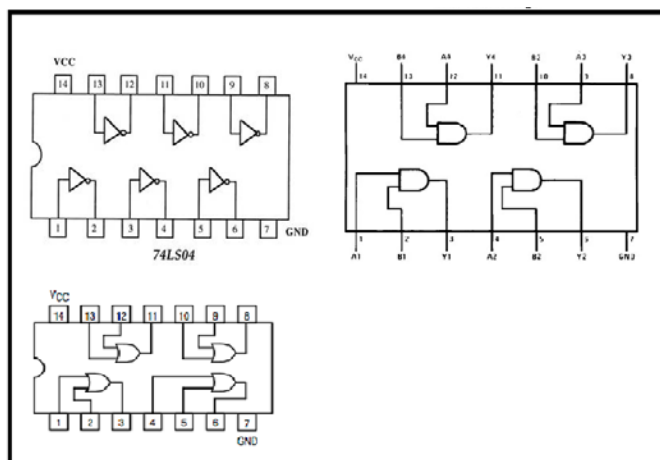

Fig. 16: Connection diagram 74LS04 (NOT), 74ls08 (AND) and 74ls32 (OR)

First I was simulated by software called Proteus (Fig. 17, 18, 19 y 20) where the drawbacks pose as solutions.

Because it tests the reader had to change the design to smaller gaps, as rising edges not read well, so we seek to improve the design of the card.
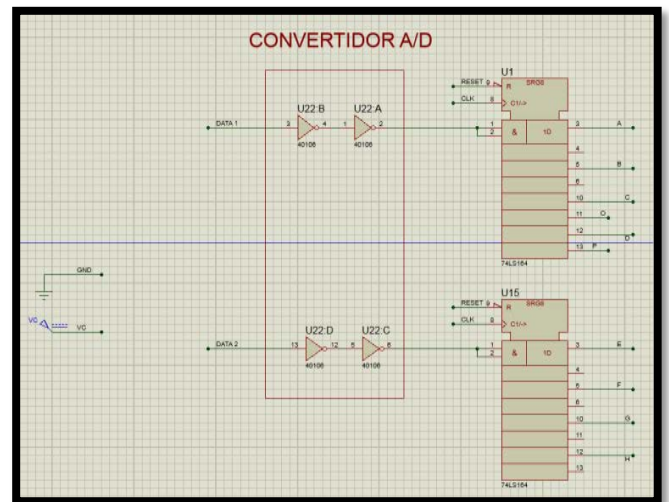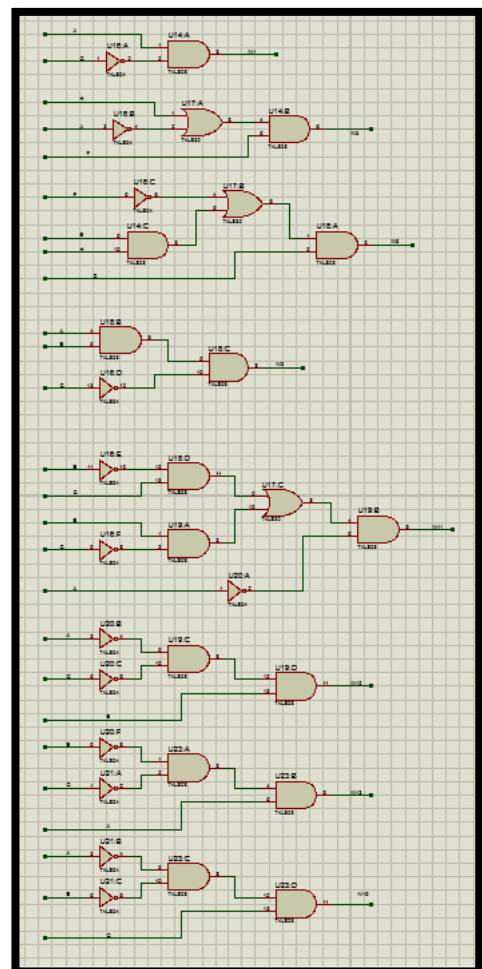

Fig. 17: A / D converter and 8-bit memories
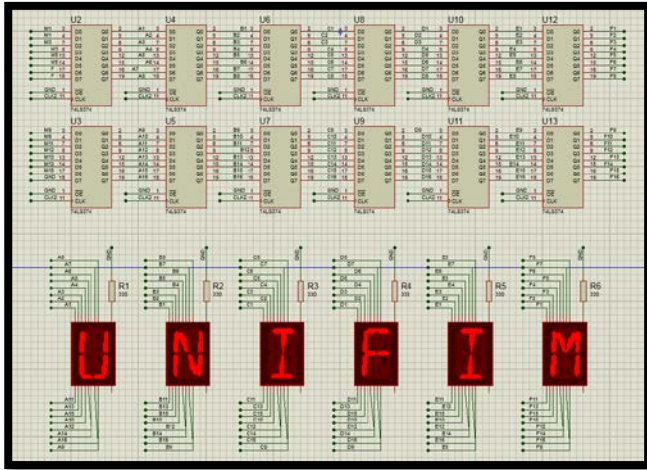

Fig. 18: Decoder

Fig. 19: Travel circuit and flip flops
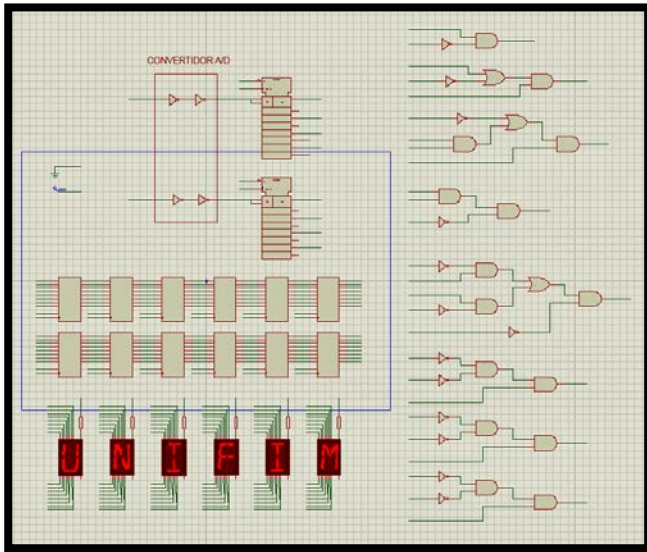

Fig. 20: Complete circuit simulation

Below in Table No.1 materials used in all stages of project implementation is.

NOMBRE	DESCRIPCION / USO
CNY70	Sensor Infrarojo
CD40106	Convertidor A/D
74LS164	Memoria de ocho bits / Registro de datos
74LS374	Flip Flops D
74LS04	Compuertas NOT
74LS08	Compuertas AND
74LS32	Compuertas OR
Displays	Display de 16 segmentos
Tarjetas	Tarjetas Preforadas-Entrada del circuito
Lector	Lector de tarjetas hecho de madera
Led	Para visualizar las lecturas de los CNY70

Table 1: Components used

RESULTS

After modifying the number scheme 1 analog to digital converter due to the new scheme remain as shown in the diagram (Fig. 21).
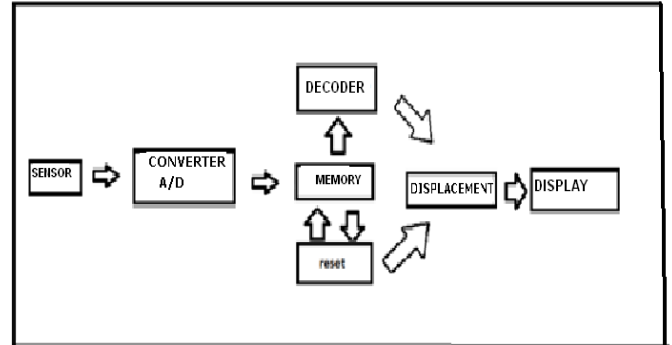

Fig. 21: New operating scheme

We chose to use a 16-segment display (Fig. 22) and that allowed us greater freedom of representation that an 8 segments, despite that greater number of pins for the operation would.
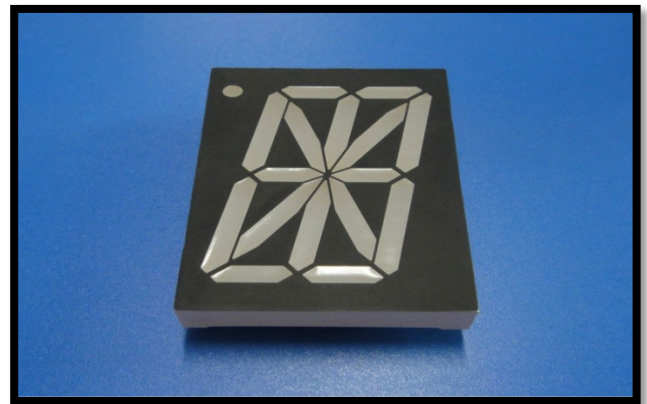

Fig. 22: Display 16 segments

Tests on the Proteus software were very favorable due to the ease offered when simulating the project.

The results due to design change were favorable and did not have to be so precise with the speed with which passed the card.

The results were as favorable grounds as solution has worked in making this card reader.

I had to make many changes in design and project logic, yet proper operation was achieved.

4 plate breadboard in total, in the following pictures the design is implemented and used in total. (Fig. 23 y 24)
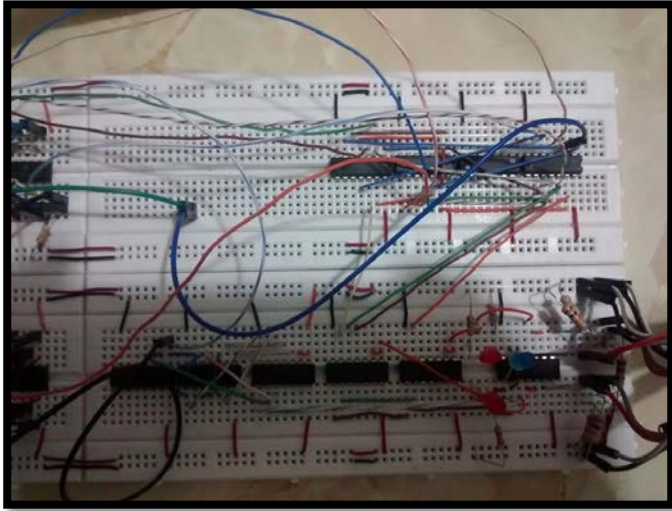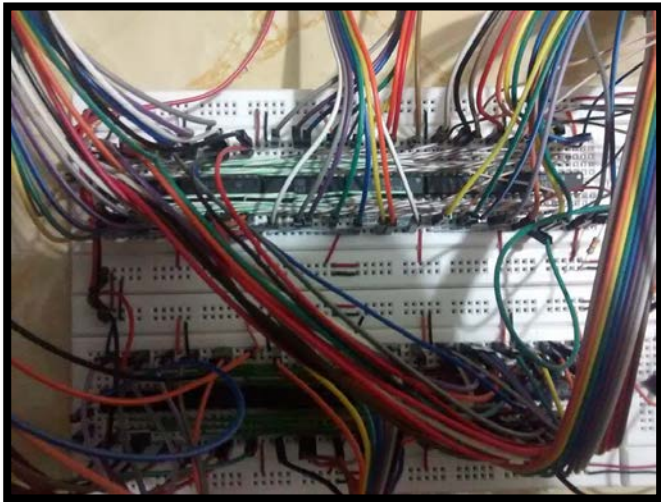
Fig. 23: A / D converter, 8-bit memory and decoder

Fig. 24: state machine connected to the displays

The total project cost is shown in Table No. 2.

NOMBRE	CANTIDAD	PRECIO C/U	TOTAL
CNY70	3	3	9
CD40106	1	1.6	1.6
74LS164	3	2.5	7.5
74LS374	12	2	24
74LS04	1	1	1
74LS08	1	1	1
74LS32	1	1	1
Displays	6	2	12
Tarjetas	6	5	30
Lector	1	5	5
Led	3	0.1	0.3
		TOTAL	92.4

Table 2: Total project budget

CONCLUSIONS

It is possible to properly implement electronic card reader for access to buildings maintaining proper quality control and efficient storage, from a design including the use of sensors 70 CNY integrated electronic circuitry to read information, a sequential circuit and letter encoder determines from the sequence of holes having a circuit board and shift register to display all the letters.

A punch card reader is very useful because many branches of learning digital electronics as they are sequential circuits, state machines, digital analog conversion, decoders and memories. This application was implemented to implement sequential circuits always have a hard time due to the large amount of current fan out and time consuming to get lost in flip flops or delays.

Using a simulator is very useful to know the path that we must follow to make a good design and implementation of any project as it optimizes costs and processing. In this case the simulator allowed us to detect errors in design of the sequential circuit and the importance of using a shift circuit for displaying data of the punched card.

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