

Microcontroller Based Office Visitor Notifier System (MBONS)

ABSTRACT: Technology has brought convenience to human activities by integrating communication model into electronics device. This work focused on Microcontroller based office visitor notifier system for establishing end to end communication network purposeful to create under cover message delivery without the visitor consent. An Atmel microcontroller was used to design and construct the system. Administrative languages were coded in alpha-numeric codes using C programming language. Communication model was setup with duplex communication link using keypad to input visitor's request at office front desk. It enabled message to be sent to host for authorization with feedback response of "Allow" or "Reject" via LCD display. The results proved that the selected Microcontroller is efficient for running secured end-end communication notification over LCD display interface. The performance is excellent for running instant message delivery on interface input/output modules with selected programmed key features.

Keyword: Microcontroller, Notifier Module, LCD Display, Front Desk, Visitor

1. Introduction

Office management is characterized with intercommunication protocol within colleagues (co-workers), higher officer to lower officer as well as protocol communication between secretary and boss. This process has regulated entry and exit of visitor demands especially during or office hours. Creating logistic notification system operated strictly on front desk prevents intrusion. Administrative communication protocol can be strictly confidential for creating, sending and delivery message from visitor log. The response from the host will be precise using three basic functions for notification system. The Sense stage of visitor arrival or visitor request for visit, the host action based acknowledgement and feedback [1].

The crucial role of the secretary in the disseminations of information is useful evidence that requires improvement on the performance of intercommunication protocol and the quality of results that they return. However, the conventional approaches of using an intercom have limitations and shortcomings especially regarding the confidentiality of the information between the visitor and the secretary. Therefore, we believe that the exploitation of contextual elements of a microcontroller could be a very good way to develop a notification unit. So, this paper aims to build an automated system that will alert an office Boss from the secretary's table that a visitor has arrived.

In many instance, visitors to large apartment complexes are typically screened by a security guard and secretary in the lobby before being allowed to enter host office. Over time, secretary and guards/ receptionist are able to immediately notify the visitor's host of the guest's arrival over the building intercom system. The notifier system could function as reception

system provides businesses and hotels with an interactive solution to present visitors with a friendly and functional means to interact with employees and hotel services include organization [2].

MBONS is implemented as a collection of agents in a multi-agent system [3] for several aims. First, the components require module platforms: for instance, the keypad interface is limited to typing text messages at both ends, while the LCD module display with attribute to output system. Similarly, MBONS users, distributed over an offices, require notification on their individual workload to determine when to and when not to receive visitors. For instance, interface can be created on visitor arrives and leaves without knowing how visitor is sent over the MBONS device. Similarly, monitoring host response message status in the office.

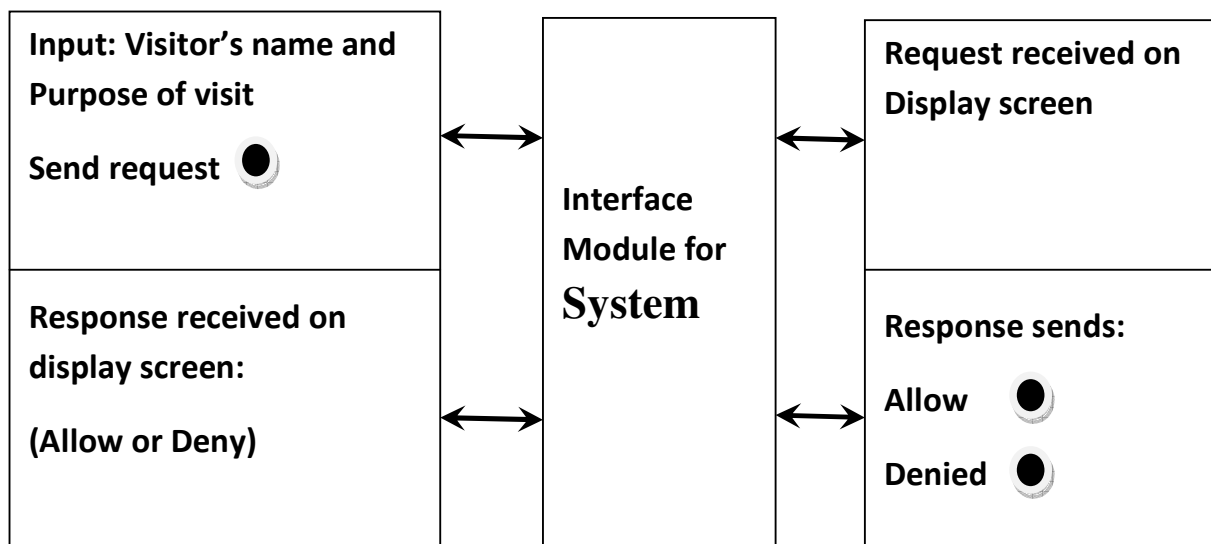
In this paper, a protocol device for intercommunication between secretary and boss is presented. The system uses Microcontroller based rules for enhancing conventional approaches of using an intercom. The system intended to establish end to end communication network purposeful to create under cover message delivery without the visitor consent.

The remaining of the paper is organised as follows: section 2 describes the need for an microcontroller based office visitor notifier system [3]. Design issues of such a system are discussed in section 3. In section 4, the representation administrative languages are presented. Finally, the paper ends with a conclusion and future works.

2. The MBONS Device Framework

MBNOS devices framework is an evolutionary interface modules that render full duplex communication using microcontroller device. This will be described in precise using block form.

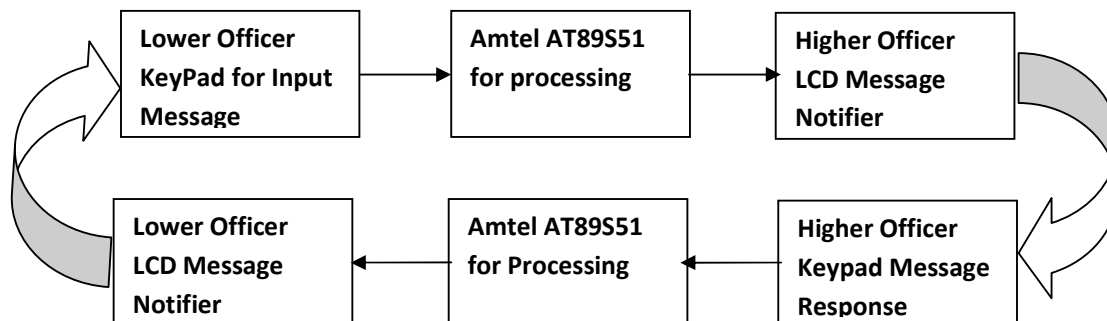
Figure 1: An overview of the internals of a MBONS model for visitor/officer relationship.



The inter-officer communications in the MBONS framework is performed using an module known as a keypad: essentially a small 4 x3 dot matrix -contained interlace flex that generate pause signal passed from office to host, containing named visitor request that can be read, added or removed. By sending request to services as message, MBONS is able to multiplex bi-directional remote end to end communications through I/O port from programmed microcontroller control method interface. MBONS can therefore provide reconfigurable officer interfaces while sending undercover static message over and made output details available on LCD [5],[6].

Figure 1 shows the internals of a MBONS desk task. The MBONS framework concentrates on` providing general low-level aspects of officer's communication model. For instance, visitors services can easily be executed in close network, and can be invoked either synchronously (function call semantics) or asynchronously (message semantics). The MBONS framework can also provide transparent support for secure interactions between lower officer and higher officer in same organisation in the initial exchange, lower officer use public-keypad authentication and create a fast symmetric session-key for further communications to higher officer based on visitor request by identifying visitor purpose of visit.

Figure 2: This diagram shows an overview of the MBONS architecture



The communication network comprises of boxes representing modules that form MBONS device. The heavier lines show the major close loop of data pathways and the light lines show communication path[7],[8]. A line with double arrows represents a synchronous data exchange while one with a single arrow indicates asynchronous data flow path. (See the text for details in methodology) Instead, MBONS enables rapid development of communities where the officer interactions can be modeled as service requests. Additionally, MBONS provides a novel, cross-office generalization of pipes [6]. This section presents an overview of the MBONS model architecture (see Figure 2) and details the important officers and their interactions. In MBONS architecture, three tasks may be summarized as:

1. visitor identification in the lobby and notification request

109 2. under covered message delivery unknown to visitors;

110 3. Response on visitor request.

111 Since these tasks occur in parallel way, lower officer perform several roles simultaneously. In
112 the primary duties, must identify visitor, and send visitor request over MBONS device. In the
113 event of a positive response from higher officer to grant visitor request, the lower officer will
114 respond to visitor based on notification on MBONS device message status grant.

115 In the other way round, a negative response from higher officer to denied visitor request, the
116 lower officer will respond to visitor based on notification on MBONS device message status
117 Denied [7].

118 3. MBONS I/O Data Communication Interface

119 MBONS device was design and constructed with microcontroller devices called ATMEL with
120 manufactured name AT89C51 which belong to 8051 family. The communication pin were
121 described in Table1.

122 Table1. *Pin description of 8051/AT89C51 microcontroller*

S/N	Ports	Descriptions
1	Port 0 (P0.0-P0.7)	It is 8-bit bidirectional input output bit addressable port. It does not have pull-up registers. It is used as LSB in data latching from external ROM or RAM
2	Port 1 (P1.0-P1.7)	It is also bidirectional I/O port.
3	Port 2 (P2.0-P2.7)	It is bidirectional I/O port. It is used as MSB in data latching from external RAM or ROM.
4	Port 3 (P3.0-P3.7)	It is also bidirectional I/O port. This port also serves the alternate function for the controller.
5	P3.0	Acts as serial input data pin (RXD).
6	P3.1	Acts as serial output data pin (TXD).
7	P3.2	Acts as external interrupt pin 0 (INT0)
8	P3.3	Acts as external interrupt pin 1 (INT1)
9	P3.4	Acts as external input of timer 0 (T0)
10	P3.5	Acts as external input of timer 1 (T1)
11	P3.6	Acts as write control signal for external
12	P3.7	Acts as read control signal for the external data memory read operation
13	XTAL1, XTAL2	Crystal oscillator pins(11.052 MHz or about 12MHz)
14	EA/Vpp	External access enable pin. It is used when we have to use

		external memory. It also receive 21V for programming on chip EPROM.
15	ALE/PROG	This is address latch enable pin. It is also used mainly when we use external memory
16	PSEN	Program store enable is an active low output signal that acts as a strobe to read the external program memory

123

124 **The Serial ports interrupt:**

125 MBON will receive 'R' data byte then a bit will be set to 1 in the SCON register and if to
 126 transmit data type 'X' then will be witted and interrupt then set in SCON. The external as INT 1
 127 are used by external CKT. It can be configured to either X' mission actionist or the external
 128 depending upon value at the units [8],9].

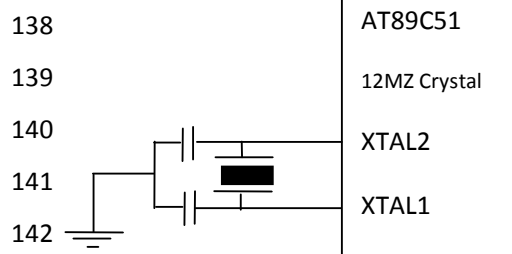
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130 **MBONS cycle and crystal frequency**

131 The 8051 used in the design has an on-chip oscillator and also requires an external clock to run
 132 it. Most case a **quartz crystal oscillator** is connected to inputs XTAL1 (pin 19) and XTAL2
 133 (pin 18). The quartz crystal oscillator connected to XTAL1 and XTAL2 also needs two
 134 capacitors of 33 pF value interface. One side of each capacitor is connected to the ground as
 135 shown in Figure 3a and 3b respectively [10].

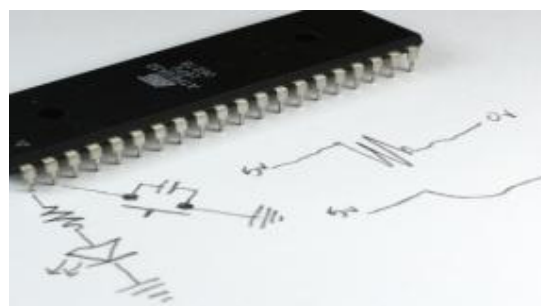
136 **Figure 3a: Crystal Oscillator**

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Figure 3b: Crystal Oscillator



144 To determined BMONS cycle for compatible chips as follow. If XTAL = 11.0592MGZ

145 For (a) AT89C51 :- $1/11.05952\text{MGZ} = 90.42 \text{ nanoseconds (ns)}$

146 Therefore MBONS cycle = $12 \times 90.42 \text{ ns} = 1.085\text{US}$

147 $1 \times 90.42\text{ns} = 90.42\text{ns}$

148 $4 \times 90.42\text{ns} = 361.68\text{ns}$

149 It must be noted for this design about various speeds of the 8051 family. Speed refers to
 150 the maximum oscillator frequency connected to XTAL. For instance, a 12-MHz chip must be

connected to a crystal with 12 MHz frequency or less. Likewise, a 20-MHz microcontroller requires a crystal frequency of no more than 20 MHz to function well. When the 8051 is connected to a crystal oscillator and is powered up, the frequency from the pin XTAL2 was clearly observed over oscilloscope. For this reason the experiment deduced that “almost” is that the number of machine cycles it takes to execute an instruction is not the same for the AT89C51 and DS89C4xO chips as narrated [7],[10].

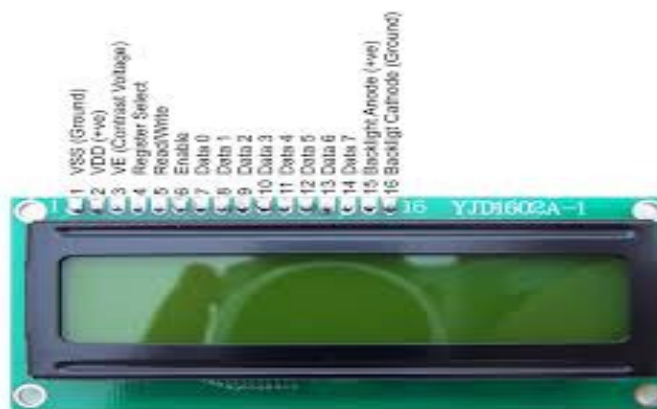
MBONS interface LCD duplex data link

The LCD (Liquid Crystal display) can deliver much information that single LED (Light Emitting diode). LCD as a display device, that efficiently deliver characters format on screen. It's noted that application of LCD varies according to application because its range in size, price and configuration, from having a couple of lines to large displays. The recommended type for this design has the ability to display four (4) lines of characters that has a 20 character line length. This is quite sufficient to show quite a bit of information. Another popular LCD has 2 lines and 16 characters per line. First, there are high decencies having a speed discrepancy between the LCD and the microcontroller. The microcontroller is much faster than the LCD module, The design deduced compensation for LCD busy time. Fortunately, the LCD will inform user of this busy status, processing status and success status. The Figure 4 and Figure 5 shown configuration pins of LCD used for interface data link.

Figure 4 LCD Pins



Figure 5 LCD Configurations



LCD used is this research employed full-duplex communication model. This configuration used was described in Table 2

Table 2: Configuration for full-Duplex data link interface with micro-controller

SN	LCD Pins	Specification	Function
1	Pin 1	VSS	Ground Pin

2	Pin 2	VCC	Power supply 5 volts
3	Pin 3	VEE	For adjusting contrast interface with potentiometer
4	Pin 4	RS	RS is the register select pin used to write display data to the LCD (characters), this pin has to be high when writing the data to the LCD. During the initializing sequence and other commands this pin should low.
5	Pin 5	R/W	Reading and writing data to the LCD for reading the data R/W pin should be high (R/W=1) to write the data to LCD R/W pin should be low (R/W=0)
6	Pin 6	E	Enable pin is for starting or enabling the module. A high to low pulse of about 450ns pulse is given to this pin. Its help to receive information
7	Pin 7-Pin 14	Port: D0, D1, D2, D3, D4, D5, D6 and D7	Used for full duplex communication to micro-controller on Port P0.0 –P0.7 (Data signal)
8	Pin 15	LED+	Back light of the LCD which should be connected to Vcc
9	Pin 16	LED-	Back light of LCD which should be connected to ground.

176

177 This following was considered while running program in C language interface environment.

178 ➤ By checking if the LCD is busy.

179 ➤ By setting the port to receive data on the microcontroller (Data direction as input).

180 ➤ By putting the LCD in read mode (RW on).

181 ➤ By putting the LCD in command mode (RS off).

182 • And lastly, the port now magically contains the data from the LCD (D7 pin will be ON if
183 the LCD is busy and OFF if the LCD is not busy).

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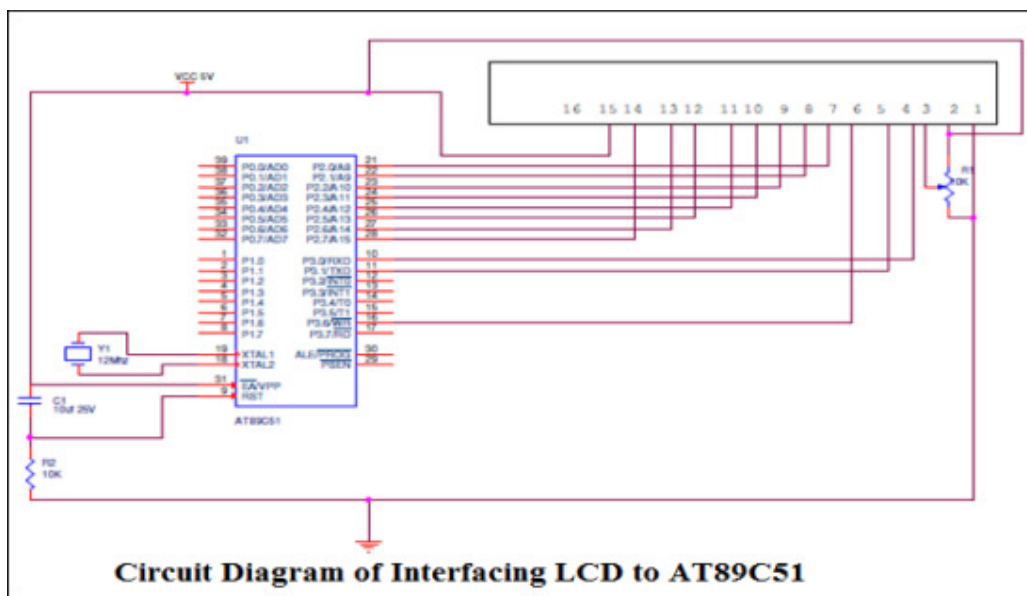
186 2. Send a command to the LCD

187 ➤ To check or verify if the LCD is busy (otherwise recommended to repeat the steps in #1
188 above).

- Setting the port direction as output so as to send information to the LCD.
 - By turning RW off so as to write.
 - By turn RS off for command mode.
 - Data line was fire up with command
 - Setup to turn on the enable and then turn it off.
 - The LCD will magically perform the command.
3. Send a character to the LCD:

This is the same manner as sending a command except the RS is on and the port will equal the character corresponding to the ASCII code. Therefore, turning pins on and off is the ultimate.

Figure 6: Circuit diagram showing interface links with LCD

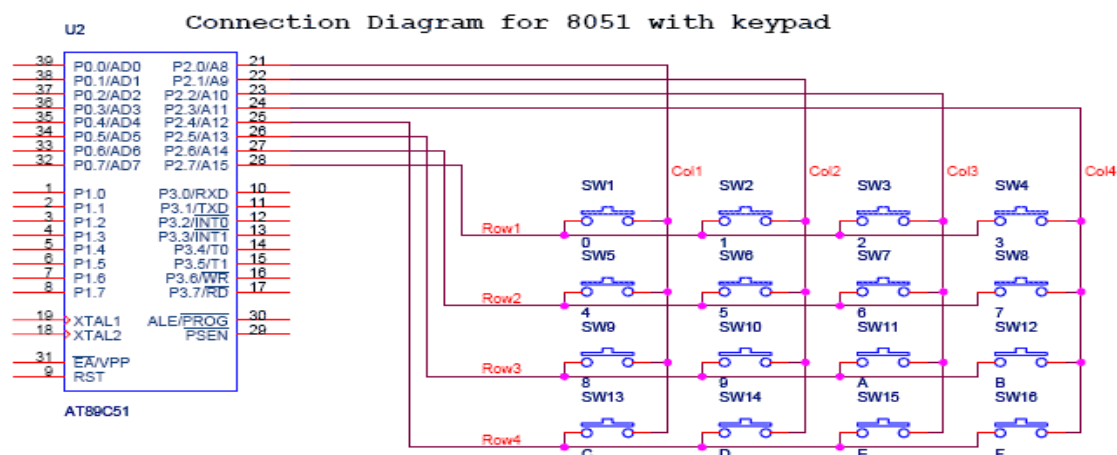


column reads '0' which denoted by administrative code used to program. Otherwise the corresponding column reads '1' (open circuit). For example if Key 5 is pressed.

R1 = 0, C1:C4 = 1111,

R2 = 0, C1:C4 = 1011

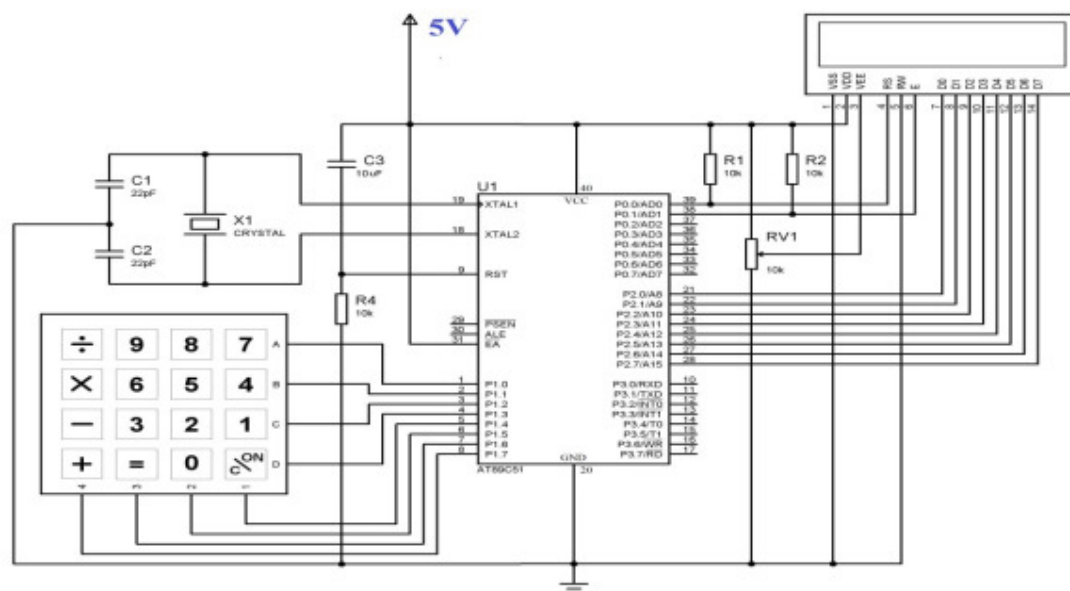
Figure 7: AT89C51 interface data link with 4X4 Keypad



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218 MBONS interface modules with Keypad and LCD

219 *Figure 8a interface data link of keypad and LCD communication duplex*



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221 *Figure 8b interface data link of keypad and LCD communication duplex*

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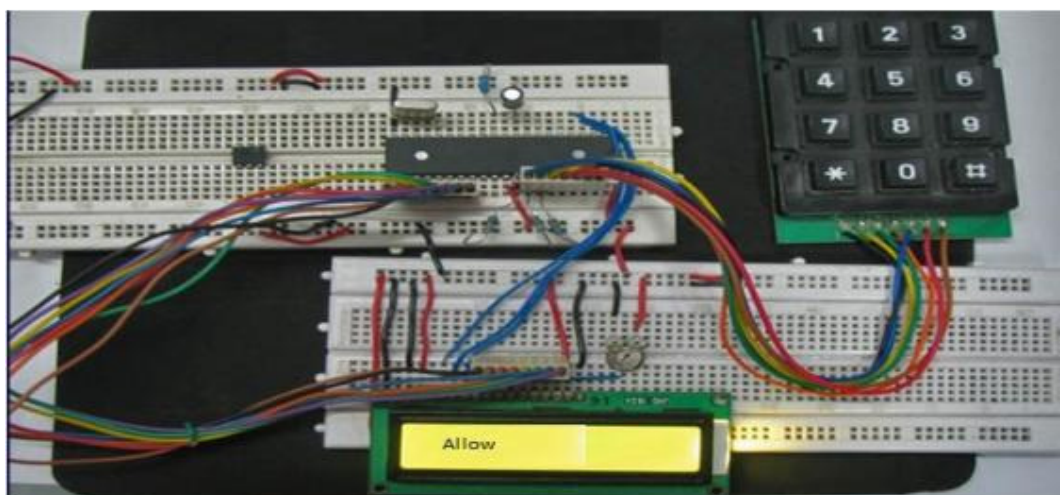


Table 4 shown the correspondent administrative codes messages in 4x4 interface duplex communications.

SN	Administrative Messages	Keypad keys
1	Examinations matter	01
2	Admission matter	02
3	Memo matter	03
4	Family matter	04
5	Official Matter	05
6	Emergency	06
7	Staff	07
8	Student Project matter	08
9	Research matter	09
10	Meeting Schedule	00

The microcontroller will spend few microseconds to scan through 16 keys for it to generate response to deliver message across.

Experiments in Visitor Notification

This section summarizes three experiments that evaluate MBONS on the task of visitor notification. All of the experiments reported here used data collected by MBONS between 15th May 2014 and September 2014. Testing was done as the visitors approached the front desk from the interior of the building. The extracted request for each visitor varies, with a median contact with lower officer. Lower officer in his or her administrative role to demand for visitation reason in other to send notification request to higher office and get response either to allow or deny

visitation without exposing conversation he or she received from the higher officer via MBONS device.

Robustness Tests

MBONS has been operational at Just Research for the last three months. To increase efficiency, we have eliminated the synthesized bulky message from the keypad [12]. The current system is quite responsive with the use of 12MHZ crystal: the notifier typically displays a message within seconds of a visitor's arrival, and occasionally after the visitor has even place request at the front desk of lower officer. The observed notifier accuracy for common visitors (colleagues at work and regular visitors with little description) was 100% with encoded administrative code [13]. For the full case, even including visitors for which required high description data exists, the observed accuracy was 75% regards secretary typing speed.

Although new visitors and infrequent visitors, with few examples description were often misclassified as stranger", the distractors had surprisingly little detrimental impact on the regular visitor log (or overall) notification accuracy. This strengthens the hypothesis that MBONS device simple view-based nearest-neighbor classification scheme may be more robust than anticipated [14].

Security Policies

The MBNOS shall allow for accurate and consistent application of security policies. The MBNOS shall check each visitor against the host employee's personal pre-authorized and denied visitors list, including a watch list of barred visitors [14]. The watch list shall provide viewing of picture and person's attributes, reason for being on the watch list, and action to perform upon arrival. The MBNOS shall check each visitor against his/her previous visit information. host shall be allowed to extend a visit or assign host responsibilities to another employee[15].

MBNOS for Host Management

The MBNOS administrator shall have full controls over what capabilities are available to which employees[16]. The MBNOS administrator shall be allowed to differentiate permanent and temporary employees, control which employees can have visitors, limit the number of daily and concurrent visitors per host, pre-authorized visitor list and personal denied visitor list [17].

Discussion

Although MBONS achieves excellent results on the standard notification system, its performance on the MBONS data shows that there is clearly room for improvement. Strategies for improving accuracy can be divided into three classes: higher-quality input data on visitor profile; combining multiple classifiers for group visitors; and better responder techniques from higher officer. Accuracy could also be improved by using short code to represent visitor status to MBONS device and combining the responder administrative language into codes.

Looking at consistent for classifying visitation request, visitor request code will be sent successfully before receiving a response notification from higher officer. Either of these schemes offers potential for officer customization. We have also experimented with several variants of visitor request that show promising performance on this task. These include: (1) better preprocessing of input visitor request to compensate for lighting conditions; (2) simple feature extraction using c programming via keil micro vision; and (3) incorporating short code for interchange information using interface module. The MBONS architecture enables us to evaluate several notification algorithms in parallel and transparently up-grade the visitor request from the lower desk officer without interruption of service.

Conclusions and Future Work

MBNOS solves a real-world application by combining request and responder for processing, machine learning and messaging technologies in an end to end communication protocol. However there is still work to be done: While we have evaluated the visitor profile on components in MBNOS, we plan to get a better idea of the over- all system's performance by getting feedback from a larger population of users to reliability. Since it is collecting a large dataset of labeled visitors, with multiple request taken over a period of time, MBNOS enables us to easily test different visitor request in real-world situations.

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