

Microcontroller Based Office Communication Model (MBOCM)

ABSTRACT:

Technology has brought convenience to office activities by integrating communication model into electronics device. This work focused on Microcontroller based office communication model for establishing end to end communication nudes primarily to achieve fast message delivery without the visitor consent. An Atmel microcontroller (AT89C52) was used to design and construct the device. Administrative languages were coded in numeric codes using C programming language and compiled with keil micro-vision compiler. Communication model was setup with duplex communication link using keypad to input visitor's request at office front desk. It enabled user to send message to host for authorization with feedback response of "Allow" or "Deny" via LCD display using wire as interlink between sender end and receiver end. The results proved that the selected Microcontroller is efficient for running secured end-end communication message broadcast over LCD display interface. The performance is excellent in terms to time response with respect to message delivery between the nudes.

Keyword: Microcontroller, Communication 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 [2]. 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 communication 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 [3].

MBOCM is implemented as a collection of agents in a multi-agent system [4] 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, MBOCM 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 MBOCM 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.

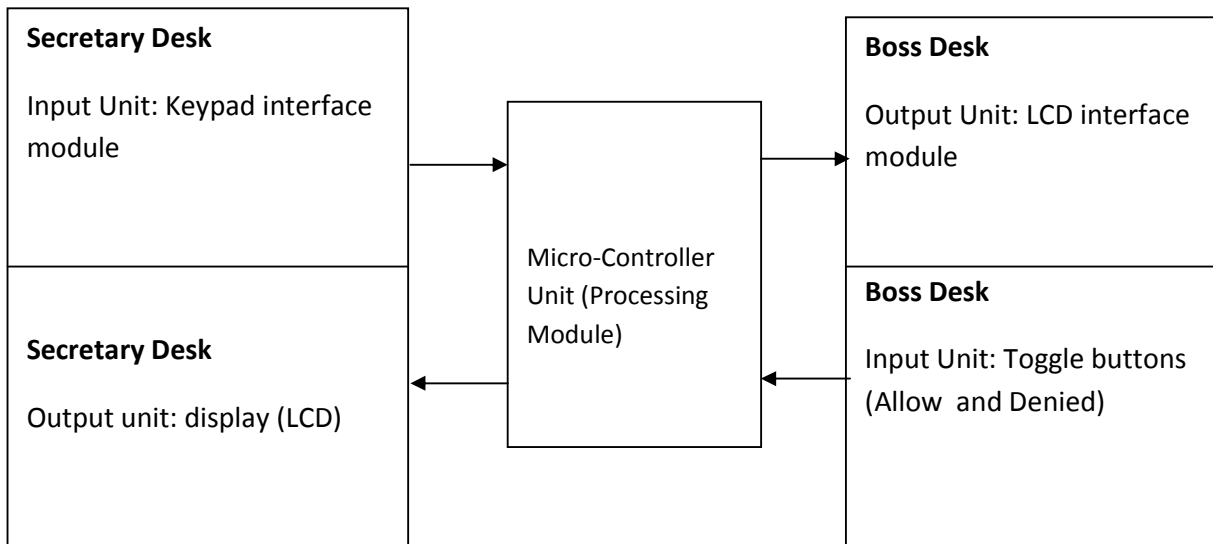
The remaining of the paper is organised as follows: section 2 describes the need for an microcontroller based office visitor Communication system. Design issues of such a system are discussed in section 3. In section 4, the representation administrative languages are presented. Finally, the paper ends with a conclusion and future works [4,5].

Many researches has been conducted and deployed into global market for user requirement (like access control system, visitor alert system, biometric access mode, auto tracking system, visitor work flow system etc) but most of these technologies focus on environmental problems which carrying different method of solving user problems. The invention of MBOCM was deduced from office visitation logistic that required scalable design layer to response to visitors flow in the remote environment.

2. The MBOCM Device Framework

MBOCM 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 MBOCM model for visitor/officer relationship.



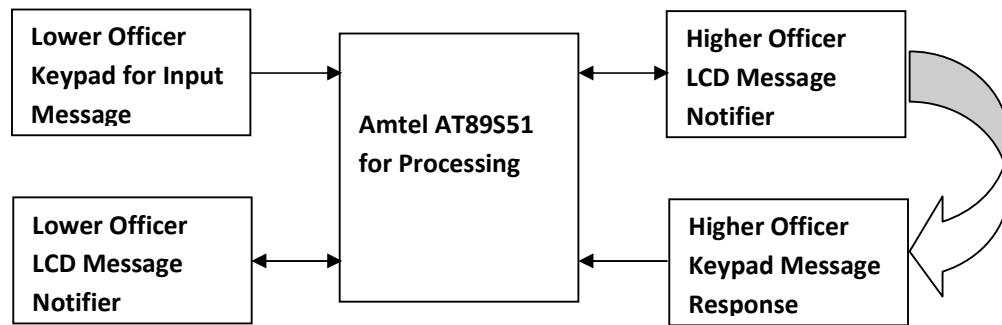
An Overview of MBOCM Components

The inter-officer communications in the MBOCM framework is performed using a module known as a keypad: essentially a small 4x3 dot matrix -contained interlace flex that generate pause signal passed from **Secretary Office to Bose Office**, containing named visitor request that can be read, added or removed. By sending request to services as **coded** message, MBOCM is able to multiplex bi-directional remote end to end communications through I/O port from programmed microcontroller control method interface. MBOCM can therefore provide reconfigurable added variable which made it suitable in different organization to manage visitor flow. **Keypad enable user (secretary or lower cadre officer) to sending** undercover static message over and made output details available on LCD [5,6].

Figure 1 shows the internals of a MBOCM desk task. The MBOCM 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 MBOCM framework is design using two ends (Lower officer and higher officer) communication wired technology which 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 MBOCM architecture



The communication network comprises of boxes representing modules that form MBOCM device. The heavier lines show the major close loop of data pathways and the light lines show communication path. 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, MBOCM enables rapid development of communities where the officer interactions can be modeled as service requests. Additionally, MBOCM provides a novel, cross-office generalization of pipes [7,8]. This section presents an overview of the MBOCM model architecture (see Figure 2) and details the important officers and their interactions. In MBOCM architecture, three tasks may be summarized as:

1. visitor identification in the lobby and notification request from lower to higher officer desk
2. under covered message delivery by lower officer unknown to visitors;
3. Response on visitor request from higher to lower officer desk

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

In the other way round, a negative response from higher officer to denied visitor request, the lower officer will respond to visitor based on notification on MBOCM device message status Denied [9].

3.0 Processing Module

MBOCM processing unit received administrative coded message via keypad and translated to machined language (see details in Table 1) display via LCD therefore AT89C52 was used to integrate all input/output modules for end to end communication.

The Serial ports interrupt

MBON will receive 'R' data byte then a bit will be set to 1 in the SCON register and if to transmit data type 'X' then will be witted and interrupt then set in SCON. The external as INT 1 are used by external CKT. It can be configured to either X' mission actionist or the external depending upon value at the units [9,10].

MBOCM cycle and crystal frequency

The AT89C52 used in the design has an on-chip oscillator and also requires an external clock to run it. Most case a **quartz crystal oscillator** is connected to inputs XTAL1 (pin 19) and XTAL2 (pin 18). The quartz crystal oscillator connected to XTAL1 and XTAL2 also needs two capacitors of 33 pF value interface. One side of each capacitor is connected to the ground as shown in Figure 3a and 3b respectively [10].

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

For (a) AT89C52 :- $1/11.05952\text{MGZ} = 90.42 \text{ nanoseconds (ns)}$

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

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

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

It must be noted for this design about various speeds of the 8051 family. Speed refers to 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 AT89C52 and DS89C4xO chips as narrated [11,12].

MBOCM 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 can display two (2) lines of characters with 20 character length. This provide fast communication link between microcontroller and the LCD module.

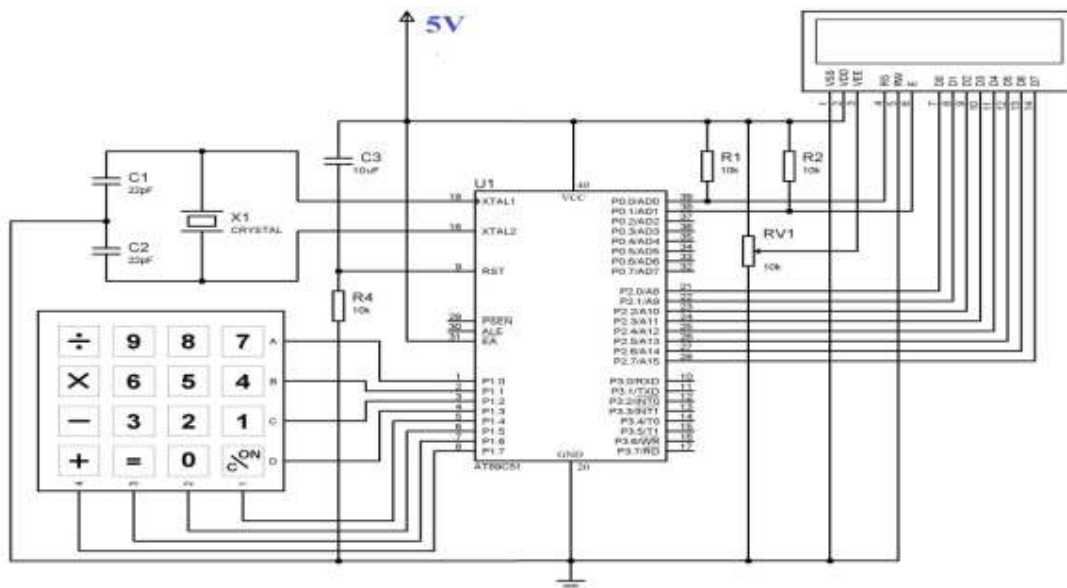
MBOCM Programmer Mode

The project cannot give expected output without been programmed, to achieved experimental aims. The program identify common administrate languages as user defined variables which can be modified or added via keypad module and conversion is done using keil micro vision compiler to machine language, therefore output file (hex file) from compiled source code. The unipro universal programmer device is used to burn output file into microcontroller.

MBOCM Keypad Data link

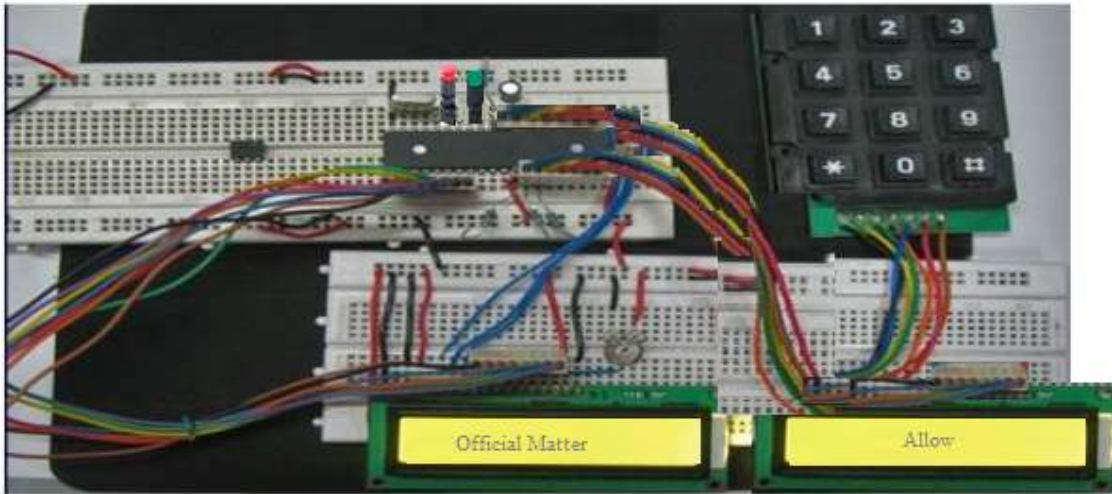
Keypad used for the design is an array of 4x4 keys with each key being a switch [7]. Each keys combination represents administrative coded messages. As a matter of fact, natural key layer as rows are connected to pins 0-3 of **Port1** and the four columns to pins 4-7 of **Port1** as shown in the **figure 6** below. The switching depends on logistic reading of a particular key which corresponding row and column driven to ports on microcontroller. If a key is pressed then microcontroller will detected corresponded coded message from the keypad. The same algorithms is used for other **ports** (2,3,4,5,6,7 & 8 respectively) for processing coded messages, therefore signal high and low signal correspond to signal enable /disable (0 and 1) [8].

Figure 3 interface data link of keypad and LCD communication duplex



The MBOCM used numeric features of keypad as coded administrative communication such as 01, 02, 03 respectively for microcontroller to detect and transmit corresponding coded messages and when ON key is press once, will send request code to microprocessor. In figure 3, pressing ON key twice will enable operation council (stop sending), this enable user (lower officer) to send coded message with fast rate without interrupting other official activities.

Figure 4 interface data link of keypad and LCD communication duplex



The MONS will prompt user (lower officer) to input request, since all administrative messages is coded with numeric combination keys, the LCD display readable text on screen for equivalent numeric input as expect output for both ends (lower officer and higher office) as shown in Figure 3 and 4 respectively.

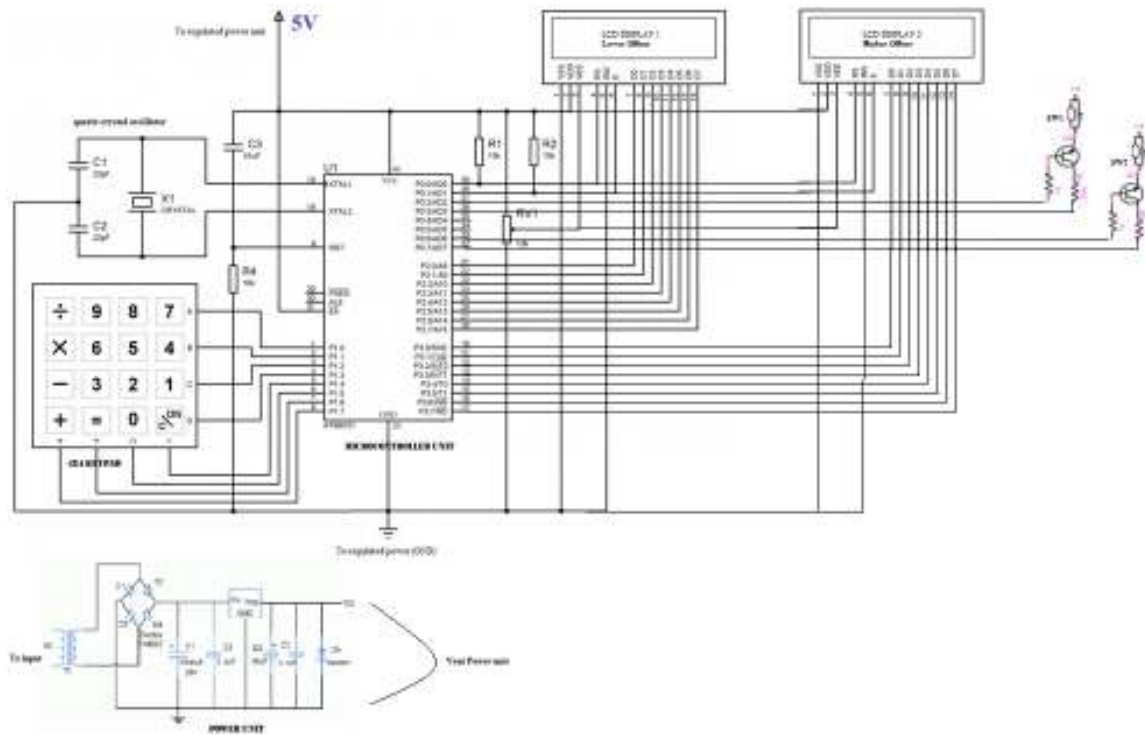
Table 1 shown the correspondent administrative codes messages in 4x4 interface duplex communications.

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

When a keypad is press by user, the microcontroller will spend few microseconds to process through 4x4 keypads with high response signal over interface keypad module. The table 1 shown the administrative messages with corresponding codes and this can be modified internally using reprogrammable device. The design external modification is enable using console

application written in c language to provide flexibility usage of MBOCM and scalability with respect to organization structure.

Figure 5: Main circuit for MBNOS system



The interface links shown on figure 5 indicates relationship between microcontroller, keypad module, power unit where the design show link of LCD module with P₀ While keypad P₁.

Experiments in Visitor Notification

This section summarizes three experiments that evaluate MBOCM on the task of visitor notification. All of the experiments reported here used data collected by MBOCM 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 MBOCM device.

Robustness Tests

MBOCM 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 Communication 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 Communication 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 MBOCM device simple view-based nearest-neighbor classification scheme may be more robust than anticipated [14].

Security Policies

The MBOCM shall allow for accurate and consistent application of security policies. The MBOCM shall check each visitor against the host employee's personal pre-authorized and denied visitors list, including a watch list of barred visitors [11,14]. 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 MBOCM 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[15,16].

MBOCM for Host Management

The MBOCM administrator shall have full controls over what capabilities are available to which employees[16,17]. The MBOCM 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 [17,18,19].

Discussion

Although MBOCM achieves excellent results on the standard notification system, its performance on the MBOCM data shows that there is clearly room for improvement. Strategies for improving accuracy can be divided into two classes: higher-quality input data on visitor profile; and better responder techniques from higher officer. Accuracy could also be improved by using short code to represent visitor status to MBOCM 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. The MBOCM does not required additional software installation that will complicate the usage therefore both capable of intercommunicate both ends with distance range 100 to 500 meter apart using serial cabling method. 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 MBOCM architecture enables us to evaluate several notification algorithms in parallel and transparently upgrade the visitor request from the internal and external interface port using technical support

Conclusions and Future Work

MBOCM solves a real-world application by combining request and responder for processing, machine learning and messaging protocol in an end to end communication protocol. However there is still work to be done: The emphasis on design packaging (casing) is a major challenges while we have evaluated future improvement on the visitor profile components for MBOCM, integrating wireless connection for easy installation. 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, MBOCM enables us to easily test different visitor request in real-world situations.

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