

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 and administrative languages were coded in numeric codes using C programming language which was compiled on keil micro-vision compiler platform. Communication model was setup using duplex communication and the interfaced keypad is to input visitor's request at lower officer front desk. The user (lower Officer) will get quick response (Allow or Deny) from higher officer therefore, the lower office will respond to visitor using MBCOM message status. The results proved that the selected Microcontroller is efficient for running secured end-end communication broadcasted over LCD display. The performance is excellent in terms to time response and also with respect to message delivery from both ends.

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

1. Introduction

Office management is characterized using intercommunication protocol within colleagues (co-workers), higher officer to lower officer and as well as communication between secretary and Bose therefore, process has regulated entry and exit of visitor especially during office hours. This research is used to create logistic notification system strictly on lower officer front desk. Since the administrative communication protocol can be strictly confidential for creating, sending and delivery message from visitor log therefore, response from the host will be precise using two basic functions for administrative response. The appearance stage of visitor arrival or visitor request for visit and 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 communication 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 well at the reception unit with an interactive solution to present visitors with a friendly and functional means to interact with employees for effective service delivery in the organization [3].

MBOCM is implemented as a collection of agents in a multi-agent system for several aims [4]. 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 functions can reduced excess workload therefore, its can be use to determine when to and when not to receive visitors. For instance, instant communication can be established when visitor arrives without visit awareness and host (higher officer) response message status will be logistically follow by lower officer in the same 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.

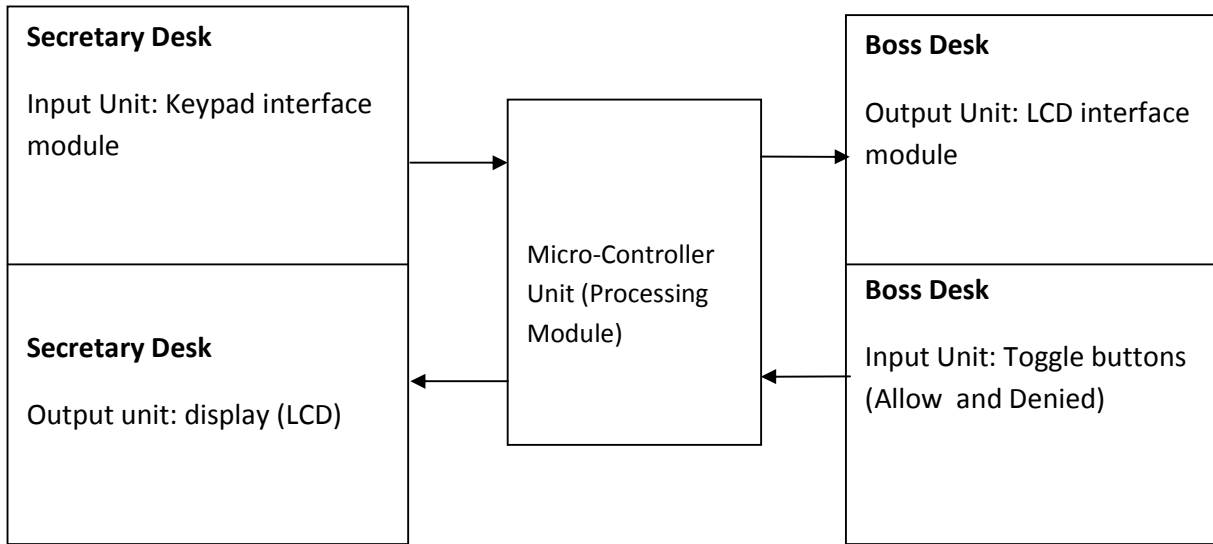
The remaining of the paper is organised as follows: section 2 describes the requirements for microcontroller based office visitor Communication system. Design issues of such a system are discussed in section 3. In section 4, the representation administrative languages are presented. Finally, the paper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

Many researches has been conducting and deploying series technology into global market on office management (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 generic environmental problems therefore adoption is not secure in all developing countries. The invention of MBOCM was deduced from office visitation logistic that required scalable design in order to be adaptive in all office environments [6].

2. The MBOCM Device Framework

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

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



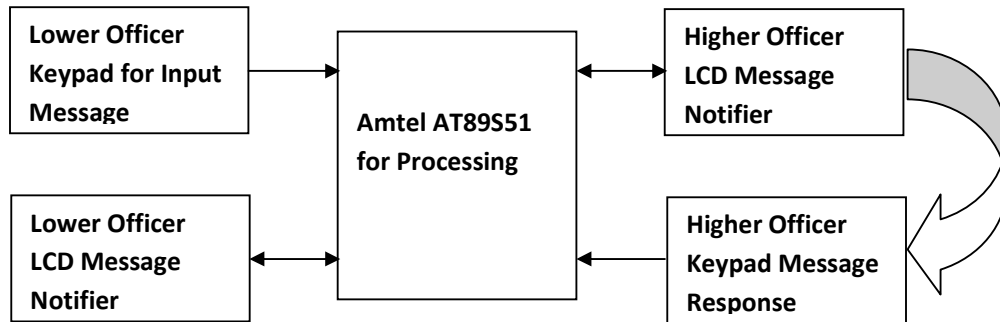
An Overview of MBOCM Components

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. This is required at lower officer desk to communicate higher officer using administrative codes, containing named visitor request that can be read, added or removed. Figure 1 is a model used when sending requested services as coded message from lower officer to higher officer. This microcontroller module has bi-directional interface that communications through I/O ports under programmed and it's used to control other interface modules (LCD and Keypad). Figure 1 indicate internal configurable using added variable (administrative message codes) which made it suitable in different organization to manage visitor flow. Keypad enable user (secretary or lower cadre officer) to send undercover static message over wired MBOCM device made output details available on LCD [7,8].

This framework concentrates on` general end to end aspects of communication model, for instance, visitor 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, 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 [9].

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 [10,11]. 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 over MBOCM LCD status Denied [11].

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

AT89C52 will receive 'R' data byte then a bit will be set to 1 in the SCON register and on request; if to transmit data type 'X' then X will be witted therefore, interrupt will be set in SCON. The external as INT 1 are used by external CKT and it can be configured to either X' mission actionist or the external depending upon value at the units [12, 13].

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, the one side of each capacitor is connected to the ground [13].

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 takes to execute an instruction is not the same for the AT89C52 and DS89C4xO chips as narrated [14,15].

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 is noted in the application of LCD types inline with design standard (IEEE) because its range in size, price and configuration, according to user applications. 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.

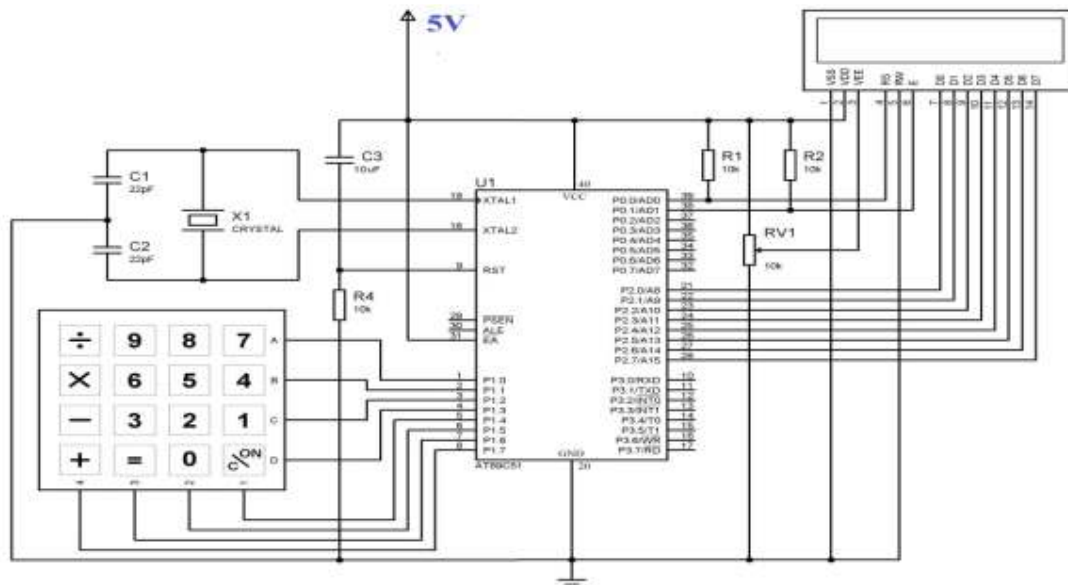
MBOCM Programmer Mode

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 service codes and compiling is done using keil micro vision software from high level programming (C source code) 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 buffer.

MBOCM Keypad Data link

Keypad used for the design is an array of 4x4 keys with each key work like a switch [15]. Each keys combination represents administrative coded messages as used during programming. As a matter of fact, the key layer formed rows and 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 is corresponded to signal enable /disable (0 and 1) [16].

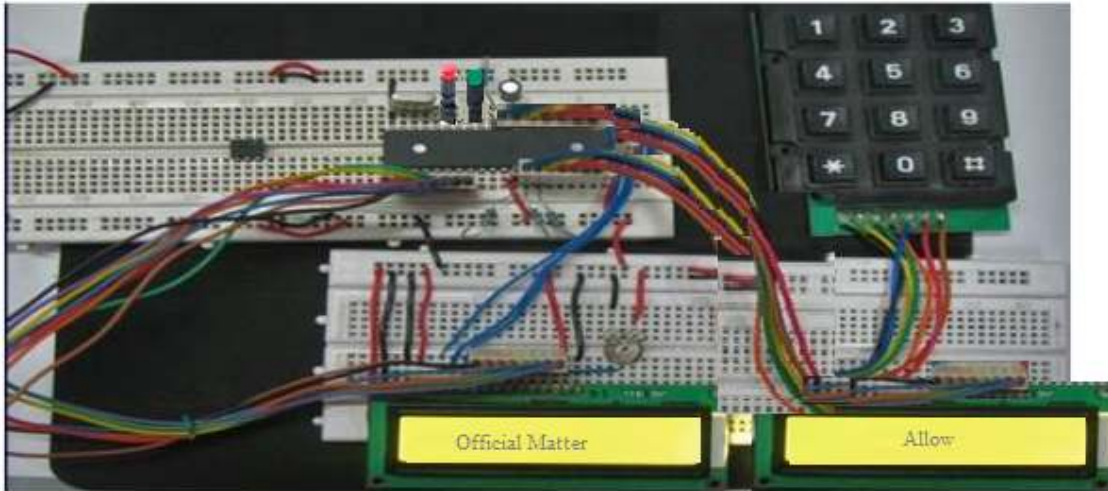
Figure 3 interface data link of keypad and LCD communication duplex



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 a key is press once, then will send request code to microprocessor. In figure 3, when user press a key twice, then its will systematically 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 device 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 4.

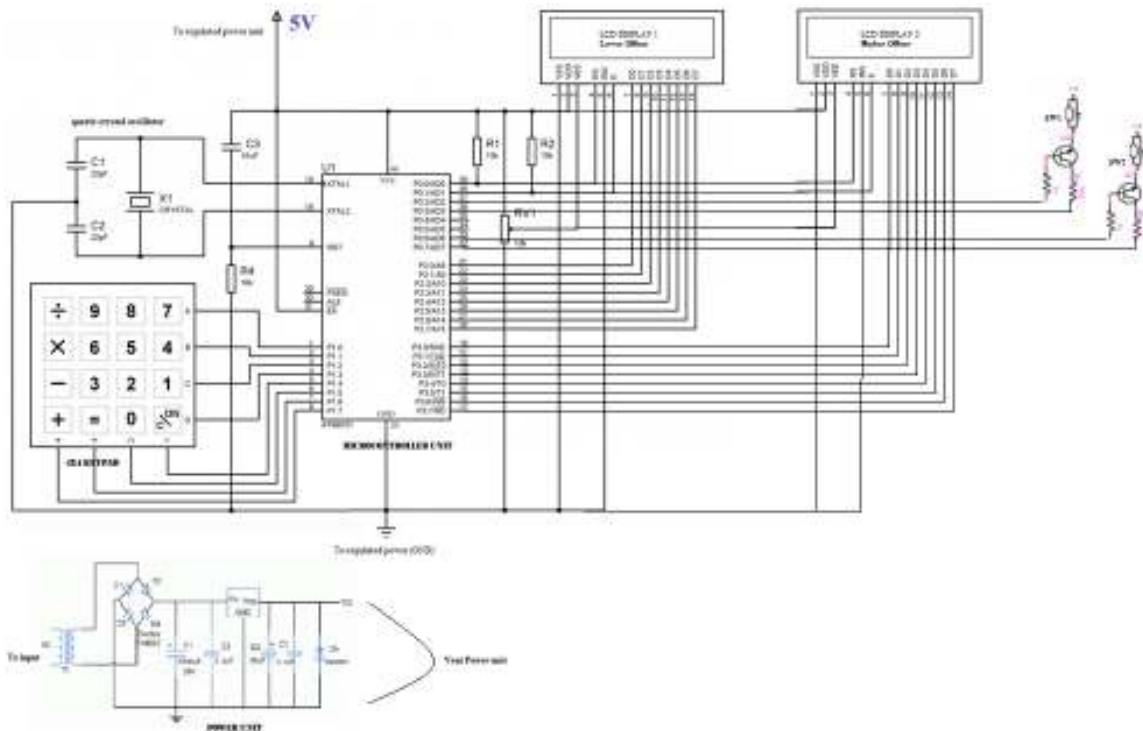
Table 1 shown the correspondent administrative codes messages in 4x4 interface duplex communications.

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
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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 corresponded 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 and two interfaced LCD using port P₀, P₂, P₃ respectively. P₂ was assigned to Keypad, P₃ assigned to LCD₁, and P₀ assigned to LCD₂ respectively.

Experiments in Visitor Notification

This section summarizes three experiments that evaluate MBOCM dynamic task using visitor request for service. 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 using a physical contact with lower officer. Lower officer in his or her administrative role used the BMOCM to place

visitor requests with no bias reason in order to evaluate efficiency of communication network without exposing MBOCM device access level to visitor.

Robustness Tests

MBOCM was subjected for 3 months lab testing in order to prove its adoption to office environment and had achieved 70% success rate. To increase efficiency, we have eliminated the synthesized bulky message from the keypad [16] and the current system is quite responsive with the use of 12MHZ crystal. The Communication typically displays a message within a minute of a visitor's arrival therefore experimentation observation is accuracy for common visitors (colleagues at work and regular visitors with little description). The encoded administrative language was 100% accurate on LCD display. For the full case, when dealing with visitor's with full description, the observed accuracy was 65% regards secretary typing speed.

This strengthens the hypothesis that MBOCM device simple view-based nearest-neighbor classification scheme may be more robust than anticipated [17].

Security Policies

The MBOCM allow accurate and consistent administrative request application of security policies. The MBOCM is application to classified visitor against the host employee's personal pre-authorized and denied visitors priority. The MBOCM is used check in each visitor against his/her primary request. The (higher officer) host has the final judgement on request send via lower office [17,18].

MBOCM for Host Management

The MBOCM administrator have full controls over functional and non functional of the communication mode. The MBOCM administrator can differentiate visitors and staff of the organisation. The control of visitors can be limited using MBOCM in two offices on daily basis [18,19].

Discussion

Although MBOCM achieves excellent results on the standard notification system, its performance 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 image capture for visitor's future references. Accuracy used in this research was adopted to improve transparency and response rate by using short code as administrative languages.

Looking at consistent for classifying visitation request, visitor request code is used to sent message successfully and receive accurate response 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 real time 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 we are upgrading the visitor request from the internal and external interface port using technical support functions

Conclusions and Future Work

MBOCM solves a real-world application by combining request and responder for processing, machine language 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 requests taken over a period of time, MBOCM future development has enables us to easily test different visitor request in real-time in our local environment.

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