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A Prototype of a Queueing Management System using Radxa Rock in Baleendah Public Health Center, Bandung

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ABSTRACT

Public Health Center is one of governments' facilities for society that always needs to be improved so it can serve the society with maximum performance to keep the society's health quality good. Queue system at public health center that not perform maximally can caused the public health center's perform ineffectively. In this study, a system consists of a single Board Computer (Radxa Rock), an object oriented programming, Gambas, and a module of a queuing system is proposed. This system works as a display and voice calling audio module, and a trigger switching module. The outcome of this research for design and implementation of patient's queue number display and voice calling audio system, button system for employee/doctor, communication protocol between button and server have run accordance the proposed design.

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1. Introduction

In KEPMENKES RI No. 128/ 2004 [1] stated that the function of *Puskesmas* (Public Health Center) is divided into three main functions: First, as the organizer of the first Public Health Effort in the region; Secondly, as a center for health information and data providers in their working areas as well as being linked to its role as a driver of health-oriented development in its region, and Third, as a first-rate, quality-oriented primary healthcare provider service user.

Based on the regulation, the outline of the *Puskesmas* should be able to provide good service as a promoter, preventive, or as gate keeper and referral provider. Surely the *Puskesmas* must be ready at all times to overcome the varying number of patients each day.

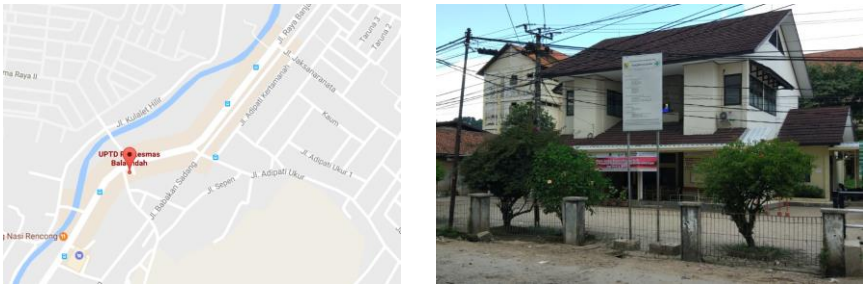

Figure 1 Location of Baleedah Public Health Center (source: Google Maps)

Baleendah Public Health Center, as shown in Figure 1, is one of a health center in Bandung which located on Jalan Raya Banjaran, Bandung Regency. Puskesmas Baleendah reaches 2 villages with the number of patients per day on average as many as 150 patients. Based on a survey conducted in October 2014, Baleendah Puskesmas do not have an electronic queuing system to accommodate the number of patients, Baleendah Public Health Center still uses traditional queuing system so the process of queuing and waiting process becomes less orderly.

Based on this background, an electronic queueing system using visual and audio is proposed to manage the patient's queue. With the proposed queuing system, the use of the waiting room is expected more efficient.

2. Proposed Queuing System Design

In general, the proposed design system in this research is described in Figure 2. This system adopted an ad hoc wireless sensor network (WSN) topology [2]. The system divided into three parts: Push Buttons-Arduino (PBA), Arduino Communication Controller (ACC) and Radxa Rock Server (RRS). The system is designed to transmit a data when a button on Push Button-Arduino is pressed. The Arduino-Radxa shall enable automation for the related actuators with user-defined settings.

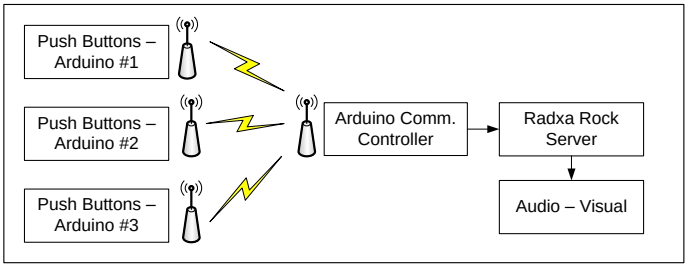

Figure 2 Proposed Queuing System

2.1. Radxa Rock

Radxa Rock, as shown in Figure 3, is SBC (Single Board Computer) based on a RK3188 by Radxa which has a quad core ARM processor that can run either android or some Linux distributions. With the features of 80 pin 2.54mm headers,

Radxa Rock is able to connect with other sensors using the General-purpose input/output (GPIO). Comparion for other types of SBC and microcontroler in processing power and compabiltiy can be found [3], [4] and [5].

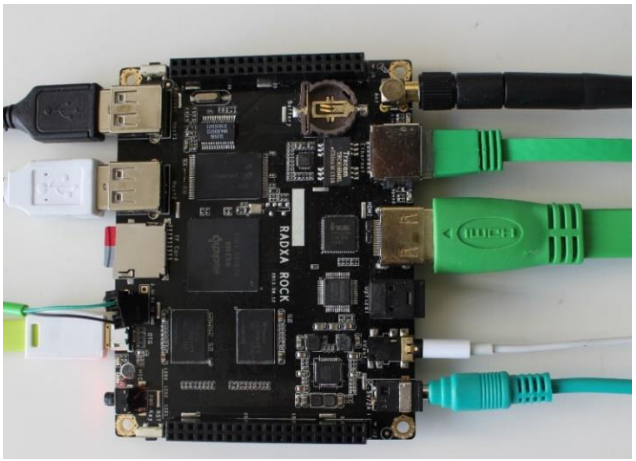

Figure 3 Radxa Rock (source: *http://wiki.radxa.com/File:Hookup.png*)

2.2. APC220 Radio Communication

APC220, shown in Figure 4, is a wireless communication module that used on this system. Several alternative modules have been studied and compared i.e. Wi-Fi, Bluetooth, ZigBee, and GSM/GPRS. [6][7][8]. One of advantage of this module that it can connect with USB to TTL ((transistor logic, where the voltage level is always 0V for LOW (0) and 5V for HIGH (1)). APC220 is used for serial communication between the push button with an Arduino that controls the queue number. APC220 have a working frequency in 420 MHz to 450 MHz and using 3.5-5.5Volt Power Supply. This APC220 module can work with range of 1200m line of sight in 1200 bps air baud rate.

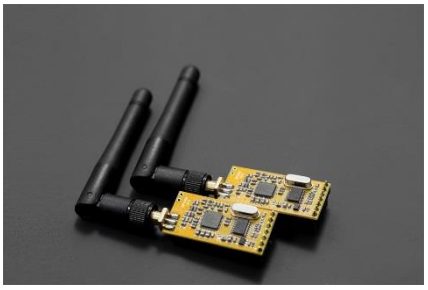

Figure 4 APC220 Radio Communication
(source: *http://image.dfrobot.com/image/cache/data/TEL0005/IMG_07752-900x600.jpg*)

2.3. Arduino Mini

One version of the Arduino product is Arduino Mini. Arduino mini module, as shown in Figure 5, is a microcontroller which very similar function with Arduino Uno board which is based on the ATmega328. The different between Arduino Uno and Arduino Mini is shown in Table 1 [9][10].

The Arduino Mini is a compact version of Arduino Nano without FTDI USB to serial connection.

Table 1 Technical Differentiate Specification of Arduino Uno and Arduino Mini

Parameter	Arduino Uno	Arduino Mini
Microcontroller	ATmega328 (SMD and non SMD)	ATmega328 (SMD version only)
Analog Input Pins	6	8
Length of Form Factor	68.6 mm	30 mm
Width of Form Factor	53.4 mm	18 mm
USB to Serial Connection	Yes	No

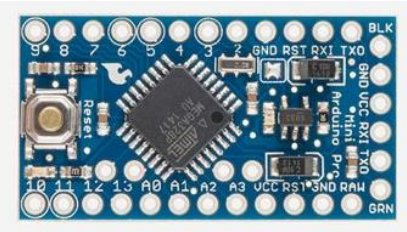

Figure 5 Arduino Pro Mini
(*source:* https://www.arduino.cc/en/uploads/Main/ProMiniFront.jpg)

2.4. Flowchart of The Proposed System

Figure 6 shows the flowchart of the proposed system. This flowchart is develop based on queueing theory for wireless sensor research [11]. This flowchart divide into three sub-system, which are : Push Buttons-arduino, Arduino Communication Controller and Radxa Rock Server.

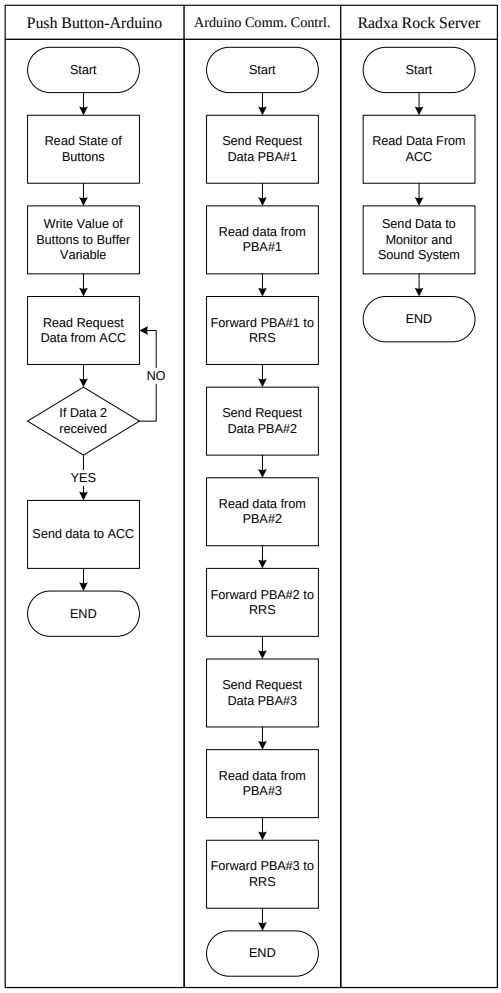

Figure 6 Proposed Flowchart of Queuing System

3. Implementation

3.1. Schematic of The Proposed System

Figure 7 shows schematic of Push Buttons-Arduino. In this figure there are 6 possible button that can be add on the system. For the proposed queuing system, only three buttons will be used.

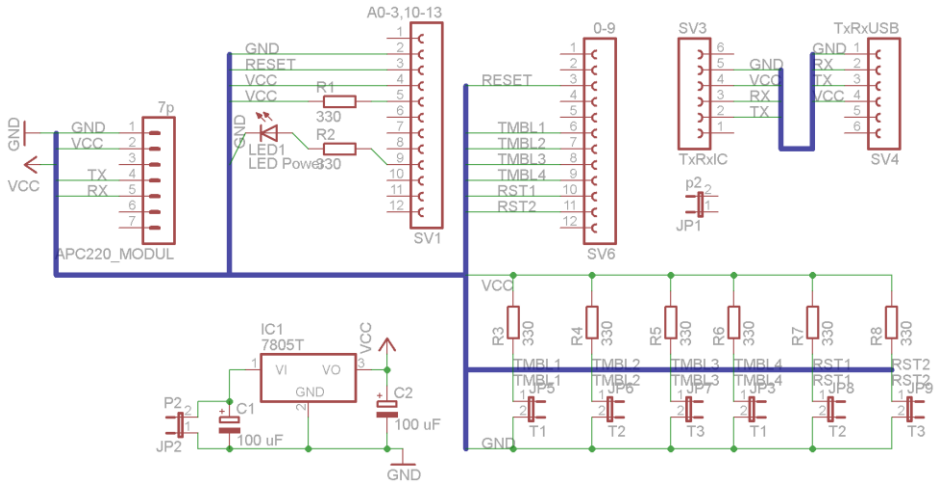

Figure 7 Schematic of the Push Buttons-Arduino Queuing System

3.2. Mockup of The Proposed System Using Gambas

In Gambas, in one project there are two parts programming, First is FMain, named as *FMain.form*. This part serves as design mock-up applications. The second part is FMain.Class. This part serves to type commands (source code) for applications that have been designed to run in accordance with the function which desired by user. Figure 8. Shows the mock-up of the proposed application.

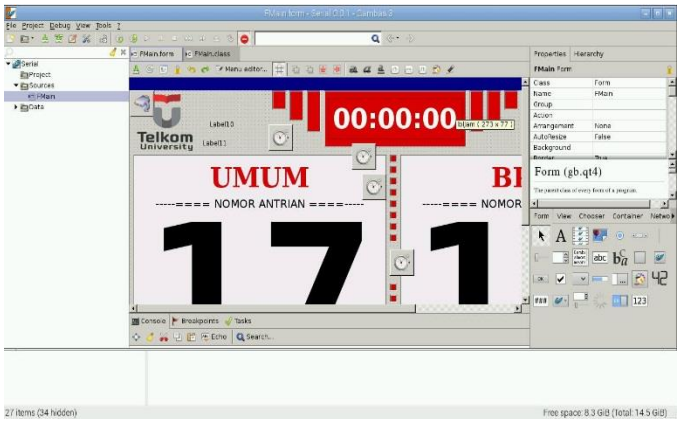

Figure 8 Mock-up Design of The Proposed System

4. Result

Table 2 shows the test implementation on the buttons on a single node queuing system with output queuing number on a display monitor and a voice on the sound system. The symbol Pressed and dash (-) on Table 2 to determine the condition whether the button is pressed or not.

Table 2 Experimental Results on Single Push Buttons-Arduino

Button 1	Button 2	Button 3	Monitor	Sound
Pressed	-	-	Add the Number	Sound the Number
-	Pressed	-	Replay the Number	Sound the Number
-	-	Pressed	Reset to zero	-

5. Conclusion

The proposed solution in this research for design and implementation of server for patient's queue numbering display and audio system, button system for employee/doctor, communication protocol between button and server have run accordance the proposed design.

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