Radio Spectrum Monitoring simulation and Design

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ABSTRACT:
With rapid development of communication industry, the kinds of communication service vary. According to the increasing use of radio waves, the intelligent and effective radio monitoring system needs to be developed, which is replaced for previous radio monitoring system. Next-Generation Intelligent Radio Monitoring System based on ITU-R, Rule of wireless facilities, and Radio Waves Act is used, and which can accurately and effectively function as effective radio monitoring system through spectrum analysis of channel power, frequency deviation, offset, and an occupied frequency bandwidth, about the analog and digital signal in On-Air of V/UHF bandwidth. In this paper, we proposes method of radio measurement and radio management through the radio quality measurement, unwanted electromagnetic signals(spurious, harmonic) measurement, high-speed spectrum measurement, frequency usage efficiency investigation, illegal radio exploration.

KEYWORDS: *Radio spectrum, monitoring station, management, mobile communication, GSM, Digital radio receiver, simulation and design, licensing, assignment and billing*

1. INTRODUCTION

According to rapid development of communication industry, communication service varies. Since Popularization of radio wave in use, technology development of new frequency band, technology revolution of wireless communication increase in radio consumption, radio environment is charged with illegal wireless equipment, unwanted electromagnetic signal, increase in wireless station, system variation, highly developed communication configuration.So, we need radio monitoring system that can manage radio efficiently and measure radio quality accurately through spectrum analysis for protecting wireless equipment and maintaining quality level of radio, communication service. Also, since conventional radio monitoring system can't measure frequency efficient use investigation and spectrum analysis that is equivalent to occupied bandwidth measurement, broadband frequency measurement, high-speed spectrum measurement, unwanted electromagnetic signal in radio quality measurement, radio monitoring system need to be developed for executing efficient radio monitoring work with reservation measurement function and automatic result storage function that can be done accurate radio measurement of local operators

II. SYSTEM COMPONENTS

MT8870D/MT8870D-1

THE MT8870D/MT8870D-1 is a complete DTMF receiver integrating both the bandsplit filter and digital decoder functions. The filter section uses switched capacitor techniques for high and low group filters; the decoder uses digital counting techniques to detect and decode all 16 DTMF tone-pairs into a 4-bit code. External component count is minimized by on chip provision of a differential input amplifier, clock oscillator and latched three-state bus interface.

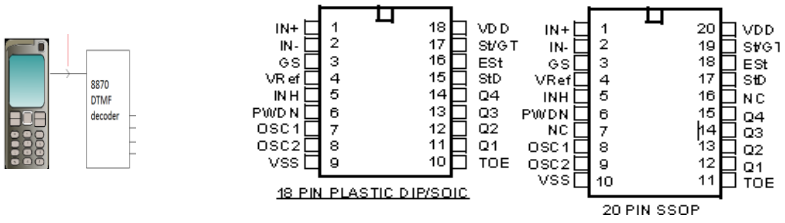


Figure.1 Pin connection [1]

PC Computer:

PC computer hosts developed software using C++ programming language to simulation radio spectrum monitoring system. The PC computer is connected with 8870 DTMF decoder via parallel port inputs and mobile. The software dictates the processor and the database to handle monitoring process. A corresponding signal is then sent via the output pins of the parallel port to the HD74LS373 latch IC[4].

DATABASE:

The Dada base consist a lot of authorized frequency that are licence by ITU-R and a NTC [2, 3]

Table.1 Operator's service frequency in Sudan

MTN	**Service**	**Band**	**Frequency Range**	**Bandwidth**
	GSM	900 MHZ	890-898MHZ	8MHZ
	GSM	900MHZ	935-943MHZ	8MHZ
	GSM	900MHZ	898-900MHZ	2MHZ
	GSM	900MHZ	943-944MHZ	1MHZ
	GSM	1800MHZ	1710-1720MHZ	20MHZ
	GSM	1800MHZ	1805-1815	10MHZ
CANAR	**service**	**Band**	**Frequency Range**	**Bandwidth**
	CDMA	450MHZ	452-457MHZ	5MHZ
	CDMA	450MHZ	462-467MHZ	5MHZ
	TD-SCDMA	2GHZ	2010-2025MHZ	15MHZ
	P-TO-M	450MHZ2GHZ	450-452MHZ	2MHZ
	WIRELESS LAN	450 MHZ	460-4622150MHZ	2MHZ
SUDANI	**service**	**Band**	**Frequency Range**	**Bandwidth**
	CDMA	800MHZ	825.030-834.33+ 870.030-879.330960 835.680-844.320+ 880.680-889.320A MHZ	9.3MHZ 8.64 MHZ
	GSM	1800MHZ	1740-1760+ 1835-1855 MHZ	12.5MHZ
	CDMA	2100MHZH	1960-1980+ 2150-2170MHZ	15MHZ
ZAIN	*GSM*	900MHZ	900-915MHZ	15MHZ
	GSM	*900MHZ*	*945-960MHZ*	*15MHZ*
	GSM	*1800MHZ*	*1765-1785MHZ*	*20MHZ*
	GSM	*2GHZ*	*1945-1960MHZ*	*15MHZ*

III. METHODOLOGY

The main goal of the proposed system is to send controlling signal remotely from mobile phone to controlled machine using mobile network. The whole system can be divided into following stages:

Mobile Phone Stage:

The C/t diagram, mobile one is a transmitter it send DTMF freq from the key bat 0 to 9 and in this C/t from 0 to 5 in the data base was used as authorized transmitter frequency while DTMF freq,Tone from 6 to 9 is treated as a non-Authorized freq tone. Form the data base.When DTMF frequency tone from 0 to 5 is received by mobile 2 which is connected the pin no. 2 of IC 8870 it is decoded and output it by pins from 11 to 14 as Q_1 to Q_{14} to as illustrated in table 2 functional decade table [1]

Table2 8870 DTMF output truth table

Digit	TOE	INH	ESt	Q_4	Q_3	Q_2	Q_1
ANY	L	X	H	Z	Z	Z	Z
1	H	X	H	0	0	0	1
2	H	X	H	0	0	1	0
3	H	X	H	0	0	1	1
4	H	X	H	0	1	0	0
5	H	X	H	0	1	0	1
6	H	X	H	0	1	1	0
7	H	X	H	0	1	1	1
8	H	X	H	1	0	0	0
9	H	X	H	1	0	0	1
0	H	X	H	1	0	1	0
*	H	X	H	1	0	1	1
#	H	X	H	1	1	0	0
A	H	L	H	1	1	0	1
B	H	L	H	1	1	1	0
C	H	L	H	1	1	1	1
D	H	L	H	0	0	0	0
A	H	H	L	undetected, the output code will remain the same as the previous detected code			
B	H	H	L				
C	H	H	L				
D	H	H	L				

L=LOGIC LOW, H=LOGIC HIGH, Z=HIGH IMPEDANCE
X = DON'T CARE

PC Computer Stage:

The data base cable (D-25 male connector) is connected to the computer pin no.10...13 to IC-74373 served as a buffer IC.

IC ULN 2001A:

ULN 2001A was served as a multi service I.C here used to control stepper motor, the relay and motor, to control. The antenna that used to receive the signals to complete the simulation of the D.F, this c/t represent only the inter connection between a receiver and a computer and the antenna of the D.F and not a c/t of D.F. The antenna that used to receive the signals to complete the simulation of the D.F, this c/t represent only the inter connection between a receiver and a computer and the antenna of the D.F and not a c/t of D.F [5]

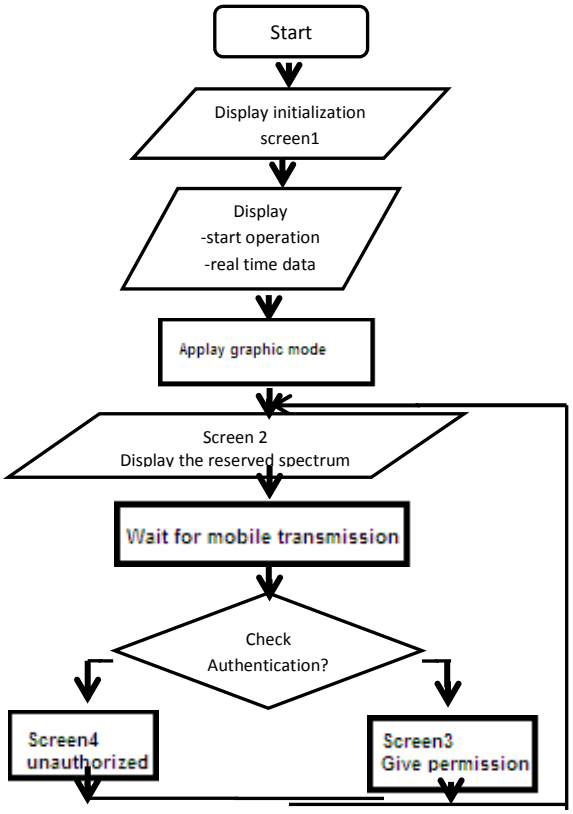
III. SYSTEM ALGORITHM AND FLOWCHART

Flowchart for Radio Spectrum monitoring

a) System Algorithm

Step1: Initialise of the Radio spectrum monitoring System
Step2: Start operation of real time data acquisition
Step3: Display the authorized reserved radio
Step4: Wait for acquisition of data transmission
Step5: If the transmission is authorized, give it permission
Step6: If the transmission is not authorized, give it rejection.

b) System Flowchart



IV. CONCLUSION

Depending on the theoretical study and simulation results presented in the thesis the following results are drawn;

a. The radio frequency spectrum range from 3KHZ to 3000 GHZ
b. It is a scarce and valuable and must be monitored.
c. Each reserved band in this spectrum can be monitored and a licensed or non-licensed transmitter can be detected and its position can be determined if a sets of directional finders was used.

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