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في هذه العشرة تم إنتاج المئات من أجهزة الراديو الرقمية التي تتميز باحتوائها على معالجات ذات كفاءة عالية. تتمتع هذه الأجهزة بجودة إتصال عالية نظراً لإعتمادها على معالجة الإشارة الرقمية وتمتلك القدرة على استعمال خوارزميات التشفير القياسية التي يصعب اختراقها إضافة إلى إمكانية انتفاعها من كافة مزايا نظم الإتصال الرقمية. نتيجة لذلك تم استبدال معظم الأجهزة التماثلية والأجهزة الرقمية القديمة.

في هذا البحث ' يتم طرح تصميم لجهاز محمول يعتمد المعالجة الرقمية للإشارة بغرض تمكين أجهزة الراديو التماثلية من الإنتفاع بكافة مزايا الإتصال الرقمية. كما يمكن استخدامه في تطوير نظام الإتصال في الأجهزة الرقمية القديمة بدون إضافة أي تعديل في تصميم هذه الأجهزة.

هذه السماعه يمكن توصيلها بأجهزة الراديو التماثلية أو الأجهزة الرقمية القديمة بغض النظر عن المدى الذي تعمل فيه واستعمالها في الإتصال بين أي جهازين متماثلين أو جهازين رقميين من نفس النوع في نمط تشغيل الصوت الصريح (بدون استعمال ترميز الصوت).

تم توضيح تصميم هذا الجهاز المحمول المعالج رقمياً ومناقشته بالتفصيل إضافة إلى توضيح الخيار الأفضل لكل جزء من الأجزاء الرئيسية في التصميم وأسباب التفضيل. تمت مناقشة محتويات البرنامج المستخدم بواسطة معالج الإشارة الرقمية وتسلسل تنفيذه نظرياً وعملياً.

تم تنفيذ تجربة تمثل تصميمياً مبسطاً لهذا الجهاز المحمول المعالج رقمياً، كما أجري على هذا التصميم إختبارات برمجية وإختبارات باستعمال الأجزاء الأصلية لتوضيح واختبار عمل هذا الجهاز المحمول المعالج رقمياً وكانت نتائج هذه الإختبارات موافقة لما هو مطلوب إلى حد كبير.

ABSTRACT

In the present decade, hundreds of digital radios are produced around the world. These radios are utilized with at least one high performance processor, which make them have good communication quality depending on Digital Signal Processing (DSP), support standard encryption, and have all the advantages of the digital communication. That makes analog radios and old digital radios inconvenient for nowadays usage and replaced by new radios.

In this thesis, a DSP-Based Handset design is proposed to utilize the analog radios with all the advantages of the digital communication and improve the existing old digital radios, without any hardware modification.

This handset can be connected to any analog radio or old digital radio irrespective to its band to communicate between any two analog radios or similar digital radios in clear voice mode, which has no voice coding.

The design of the DSP-Based Handset is demonstrated and discussed in details. The appropriate choices for the main parts of the hardware are mentioned and the reasons of selection are explained. The DSP program steps and flow are discussed theoretically and practically.

An experiment that represents a simplified design of the DSP-Based Handset is implemented. Software and hardware tests are applied on this experiment to explain and test the design of DSP-Based Handset. The tests results were almost matching the intended results.

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ABBREVIATIONS

ADC	Analog to Digital Convertor
AES	Advanced Encryption Standard
ALU	Arithmetic Logic Unit
AM	Amplitude Modulation
AR	Auto Regressive
ASK	Amplitude Shift Keying
AWGN	Additive White Gaussian Noise
CCITT	Consultative Committee for International Telephone and Telegraph
CCS	Code Composer Studio
CELP	Code Excitation Linear Prediction
CODEC	Coder and Decoder
CPU	Central Processing Unit
D/A	Digital to Analog
DAC	Digital to Analog Convertor
DC	Direct Current
DES	Data Encryption Standard
DFT	Discrete Fourier Transform
DM	Delta Modulation
DPCM	Differential Pulse Code Modulation
DSP	Digital Signal Processing
FFT	Fast Fourier Transform

FIPS	Federal Information Processing Standard
FIR	Finite Impulse Response
FM	Frequency Modulation
FPGA	Field Programmable Gate Array
HDL	Hardware Description Language
HF	High Frequency
HPF	High Pass Filter
HPI	Host Port Interface
IC	Integrated Circuit
IDE	Integrated Development Environment
IIR	Infinite Impulse Response
JTAG	IEEE std. 1149.1 compliant interface
LP	Linear Prediction
LPC	Linear Prediction Coding
LPCs	Linear Prediction Coefficients
LPF	Low Pass Filter
McBSP	Multichannel Buffer Serial Interface
MELP	Mixed Excitation Linear Prediction
NIST	National Institute for Standards and Technology
OFDM	Orthogonal Frequency Division Multiplexing
OOK	On Of Keying
PLL	Phase Locked Loop
PM	Phase Modulation
PRD	Timer Period register

PSC	Pre-Scaler Counter
PSD	Power Spectral Density
QAM	Quadrature Amplitude Modulation
RAM	Random Access Memory
RF	Radio Frequency
ROM	Read Only Memory
RTDX	Real Time Data Exchange
SPI	Serial Peripheral Interface
SNR	Signal to Noise Ratio
SWI	Software Interrupt
TDDR	Timer Divide Down Ratio
TI	Texas Instrument
TIM	Timer count register
TRB	Timer Reload
TSS	Timer Stop Status
UHF	Ultra High Frequency
USART	Universal Synchronous Asynchronous Receiver and Transmitter
VHF	Very High Frequency

