

Chapter 13

A New Coding Scheme for Data Security in RF based Wireless Communication

Irfan Habib

Assam Don Bosco University, India

Suman Chetia

Assam Don Bosco University, India

Atiqul Islam

Assam Don Bosco University, India

Samar Jyoti Saikia

Assam Don Bosco University, India

ABSTRACT

A radio-controlled (RC) aircraft is controlled remotely by a hand-held transmitter and a receiver within the craft. The working mechanism of such an arrangement designed using an AT89S51 microcontroller is reported in this chapter. The primary focus of the chapter is to describe the design of the interfacing of transceiver module with AT89S51 microcontroller and control the movement of the aircraft according to the instruction given remotely. The microcontroller reads the input given by the user and transmits the data to the receiver at the aircraft. The receiver module receives the transmitted signal and demodulates it and gives the data as serial sequence of bits at the output. The serial data are then given to the decoder which transforms the data from serial to parallel. This set of data is used to control motors and any related device. A special coding technique is used to secure the transmitted data.

INTRODUCTION

The Unmanned Aerial Vehicle or the wireless plane can be used in various ways. It can reach a place where other plane can't reach. It can also reach a place where the weather may be harmful for human being. It can be used in surveillance over an area, traffic control etc. But in today's world the main use of these wireless plane or unmanned aerial vehicle is as a bomber over various parts of the world without losing any human life and now a day's various countries are using this technology in their military build up.

The main components of the microcontroller based RC plane has two parts transmitter and receiver, which consists of Atmel's AT89s51 microcontroller IC, brushless DC motor, servo motors, current

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controller, transceiver module, push buttons and the foam-wooden mechanical body of the plane. The transmitter part consists of microcontroller and the transmitter module. The encoder converts the parallel data entered by the user to serial and gives it to the transmitter module and it transmits the data. The receiver receives the exact serial data and gives it to the microcontroller. The microcontroller again converts the data to parallel form and according to the program the brushless DC motor and the servos are controlled, where the servos need a PWM signal to move the rotor to left or right and the brushless DC motor needs a continuous current to keep running. By using ASK and different bit streams the movements of the plane can be controlled. Microcontroller is used to rotate different motors according to the transmitted data.

Wireless communication has grown largely in last decade and it is constantly expanding. It can also be used for data communication to control various remote devices such as airplanes, cars etc. Data security plays a vital role in these kinds of design issues. Different coding schemes can be used to encrypt the data. In our work we have implemented a simple and unique coding scheme by generating a bit sequence to secure the data transmission along with already available coding schemes.

LITERATURE SURVEY

Some of the recent works have given stress on the design mechanical modelling and encoding and decoding methods used in wireless channels. A few related works are covered and included which have been referred while carrying out the work.

1. The paper entitled hardware/software architecture designed for use as avionics for mission and payload control by E. Pastor, J Lopez and P Royo in the area of Unmanned Aerial Vehicles. Here the design tackles a number of elements critical for the operation of these systems. The architecture is a LAN-based pure distributed system, being therefore highly modular and scalable according to the requirements of the applications. A small connectivity infrastructure is required among the modules, but yet enough connectivity bandwidth could be obtained (Pastor, Lopez & Royo, 2007).
2. A work by S. Naskar, S. Das, A. K. Seth, A. Nath, which defines robot as “a machine that looks like a human being and perform various complex acts; a device that automatically performs complicated, often repetitive tasks; a mechanism guided by automatic controls.” a paper on military robots. This work is an extension to it. A new feature called 'back tracking' has been introduced in the robot described in this paper. The design and the Microcontroller of this robot have been improved and a cost- benefit analysis is shown to justify the feasibility of military robots in Indian Defence (Naskar, Das, Seth & Nath, 2011).
3. The Impact of Human-Automation Collaboration in Decentralized Multiple Unmanned Vehicle a paper by M. L. Cummings, J. P. How, A. Whitten and O. Toupet in the future concept of one operator supervising multiple collaborative UxVs, the potential exists for high operator workload and negative performance consequences. As a result, significant autonomy is needed to aid the operator in this multiple UxV control task. Due to the dynamic and uncertain nature of the environment, control of collaborative and decentralized UxVs requires rapid automated replanning. However, as demonstrated in this study, human management of the automated planners is critical, as automated

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