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Title: Reusable Fm0 Sols Encoder For Dsrc Applications.

Volume 07, Issue 02, Page No: 244 – 248.

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REUSABLE FM0 SOLS ENCODER FOR DSRC APPLICATIONS

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ABSTRACT:

In the intelligent transportation system a protocol is used to transmit the information signals that is DSRC protocol which is abbreviated as dedicated short range communication. Here the information signals are transmitted by this DSRC protocol only. This protocol is encoded by using some modes they are either FM0 and Manchester codes. Depending upon the diversity of this codes the design limits the VLSI architecture. Now in this paper we are using a new VLSI architecture design where the both codes are reused and forwarded in proposed system. The entire design depends upon the technique of SOLS that is similarly oriented logic simplification by this technique we can achieve the effective system performance.

1.INTRODUCTION

Dedicated Short Range Communication (DSRC) is a protocol used for communication for a short range of distance, say a few hundred meters through a dedicated channel.It is used to introduce intelligent transport system into our day to day life. The DSRC communication aids in both vehicle to vehicle communication as well as vehicle to roadside communication.The vehicle to vehicle communication mainly deals with the collision alarms, hard break warnings etc. At the same time the vehicle to infrastructure communication includes the Electronic Toll Collection (ETC), highway-rail intersection warning, in vehicle signing etc.

However the primary motivation of the DSRC communication channel is collision detection and vehicular safety. In addition to it, it also aids in smooth traffic control. The DSRC equipment mainly consists of three modules namely; base band processors, RF front end and the microprocessors. The microprocessors are responsible for scheduling the tasks of base band processing and RF front end and intercept the instructions. The RF front end takes care of the transmission and reception of data. Finally main function of the base band processing includes modulation, error correction, clock synchronization, and encoding. For the purpose of encoding data, normally an FM0 or Manchester encoding are used so as to reduce the chances of occurrence of noise in the channel when it is left idle.

When a system that can be reused between both the FM0 and the Manchester encoding is implemented, the hardware utilization rate is reduced thereby reducing the efficiency. This in turn affects the performance of the system. Hence a new method of designing a reusable VLSI architecture is proposed. This novel method of designing called the Similarity Oriented Logic Simplification (SOLS) improves the hardware utilization rate of the

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reusable architecture thereby improving the performance and area footage.

2. RELATED TECHNOLOGIES

2.1 DSRC Protocol

Dedicated short range communication (DSRC) is a fast, short to mid range, wireless technology. It enables one way or two way communication between vehicles or between vehicles and roadside. It is to used make streets safer, travel easier and minimizes the impact vehicles have on the environment. It provides vehicles and infrastructure the ability to communicate with each other at a rate of 10 times per second. [1] In DSRC communication, the most important concern is collision detection. Each DSRC equipped vehicle broadcasts its basic information including speed, trajectory, location etc to a short range of distance, say a few hundred meters. All other DSRC equipped vehicles in the vicinity receives this message. Later on this message is decoded by the receiver vehicles and a caution or warning may be issued to the driver. This can be issued audibly, visually or haptically [3]. The DSRC communication is based on direct communication between vehicles and hence does not need networking. Therefore it is also referred to as single hop. This type of communication can also be referred to as uncoordinated broadcast messaging. Each DSRC equipped vehicles can extend this network to its neighbors and hence this network can grow unbounded. In case of safety, privacy is also an important concern. Therefore all safety communications are carried out in the control channel only. The safety communication involves two types of messages:

- Routine safety messages: These are status messages including change of speed, location, etc that are regularly sent by the vehicle.
- Event safety messages: These are messages that signify an event like a hard brake.[3]

3. METHODOLOGY

3.1 FM0 Encoding

FM0 encoding is also a type of Non-Return to Zero code. It is also used to represent the binary signals in a digital system. In FM0 encoding, even though the data stream does not encounter transition, the encoded signal experiences a transition for every clock cycle. The FM0 encoding can be specified by using the three basic rules[1]. They are as follows:

1. There should be transition for every logic zero input within a clock cycle.
2. There should be no transition for logic one input.
3. There should be a transition after every clock cycle irrespective of the input data.

FM0 encoding can be realized by using two flip-flops and also multiplexers. The FM0 encoding can be implemented by using the block diagram as shown below in fig 1. In the following block diagram, A(t) and B(t) signifies the two states.

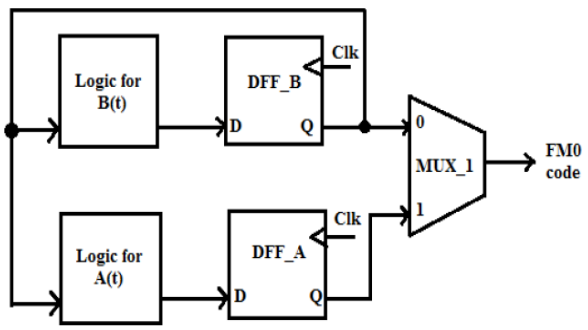

FIG. 1 FM0 ENCODING

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3.2 Manchester Encoding

One of the most common data coding methods used today is Manchester encoding. Manchester coding gives a way of adding the data rate clock to the message to be used at the receiving end. To represent the binary values 1 and 0 in digital system, the Manchester codes are used. Manchester code represents binary values by a transition rather than a level. Manchester coding states that there will always be a transition of the message signal at the mid-point of the data bit frame. What occurs at the bit edges depends on the state of the previous bit frame and does not always produce a transition. A logical 1 is defined as a mid-point transition from low to high and a 0 is a mid-point transition from high to low.[1] An example of a Manchester encoding is shown below in Fig 2.

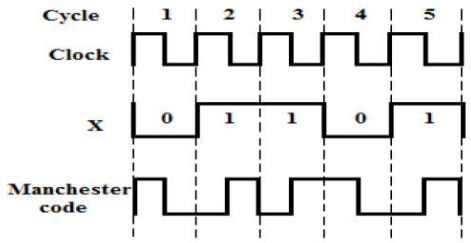

Fig. 2 Manchester Encoding

The Manchester encoding can be implemented using an XOR gate where the clock signal and the data signal are XORed together to obtain the encoded data as shown in the diagram below Fig 3.

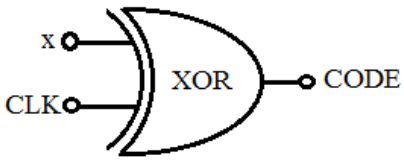

Fig. 3 Encoded Data With Xor

3.3 SOLS Technique

Normally DSRC encoders make use of both the FM0 and the Manchester encoding. Hence both the encoders can be combined together to form a reusable encoder. Such a reusable encoder can be illustrated as shown in the figure 4.

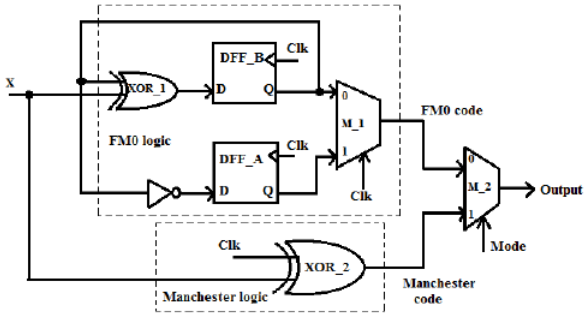

FIG. 4 SOLS TECHNIQUE

This block diagram can be further simplified using the SOLS technique. The SOLS encoder consists of mainly two methods, area compact retiming and the balance logic simplification. [1]

3.3.1Area Compact Retiming

This method is mainly used in simplifying the FM0 encoder. For FM0 encoder, the state code of each state A(t) and B(t) is stored into separate flip flops. Since the transition of state code only depends on B(t), the encoder needs only a single bit flip flop. Hence the block diagram is rearranged as shown in the fig 5.

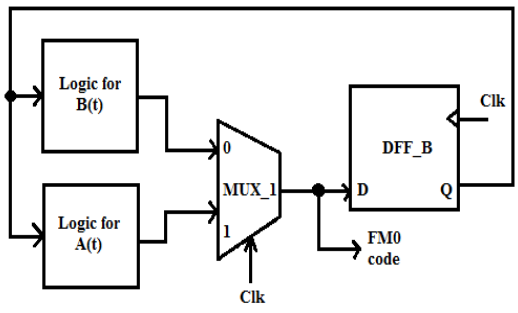

FIG. 5 FM0 ENCODER WITH STATES

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3.3.2Balance Logic Simplification

This technique deals with the Manchester encoder. Usually Manchester encoding can be treated as the XORing between the input signal and the clock. But it can also be treated as a Multiplexer where the clock is given as the select input and the data and its complement is given as the data input. This is better explained by the fig 6.

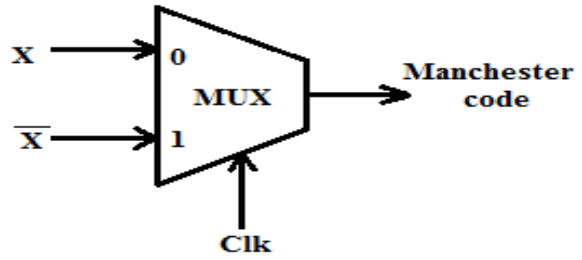

Fig. 6 Manchester Encoder With Balance Logic

4. RESULTS AND DISCUSSION

RTL SCHEMATIC

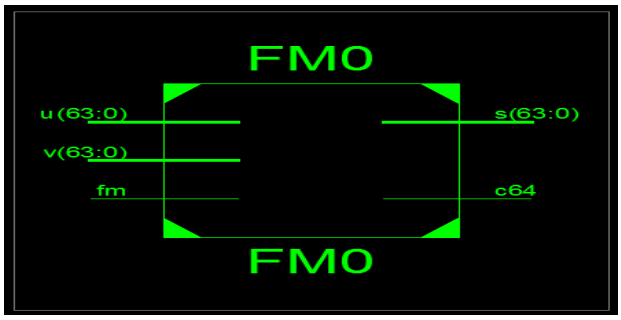

Fig. 7 Rtl Schematic

OUTPUT WAVEFORM

Fig. 8 Output Waveform

5. CONCLUSION

As we know that the main advantage of intelligent transport system is smooth traffic control and vehicle safety. Fir developing this system we use an DSRC protocol. In DSRC protocol we can observe that the messages are encoded first and then transmitted to next DSRC vehicles. After transmitting to another DSRC vehicle the information is enhanced by security of vehicles. As discussed earlier that we use two codes that is FM0 and Manchester for the purpose of coding. To get better results compared to the existed system an system is proposed that is SOLS. this technique gives better results and produces low delay. In the same the memory usage of this system is very low.

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