International Journal of Engineering Technology and Applied Science
(ISSN: 2395 3853), Vol. 3 Issue 5 May 2017

Simulation analysis For Measurement of Distance and their relative motion of Obstacles Surrounding Sub-Marine

[1]Ashish Dubey, [2]Anjan Kumar Gupta, [3]Jitendra Soni, [4]Dilip Ahihwar
[1]M-Tech Scholar, [234]Assistant Professor
[123]Department of Electronics & Communication Engineering, ADINA, Sagar, India

Abstract: Automation technologies have provided us with various systems that reduce the time and human error. Particularly the heavy vehicles like aircraft and submarine are very difficult to operate manually in heavy traffic. As personally one is very careful about, otherwise damage being caused to the system. In view of this to provide a proper guidance to the system in heavy traffic, means are provided. We have enhanced the facility by using automatic breaking when an obstacle is close by. Therefore, in this paper we propose a "Distance measurement with Automatic Braking system" to prevent collision by using correlated sequences for correlation radar to detect obstacles. The "Automatic Braking system" will process the signal activities and their echo's and controls the system to prevent accidents caused by careless driving or difficulty in detecting objects in the path. In this controlling logic is implemented on VHDL using Xilinx software. The system designed by VHDL keeps a distance between the object and system to prevent accidents.

Keywords: PN Sequence, Correlation Radar, Avoid collision, Doppler Effect.

I INTRODUCTION

The basic principle of operation of primary radio detection and ranging is easy to know. The implementation and operation of primary radars systems involve a large vary of disciplines like building works, significant mechanical and technology, high power microwave engineering, and advanced high speed signal and processing techniques. A radar or microwave radio detection and ranging or radio detection and ranging or radiolocation or measuring instrument or measuring system or measuring device} system incorporates a transmitter that emits radio waves known as radar signals in planned directions. Once these inherit contact with associate object they're typically mirrored and/or scattered in several directions. The {radar or microwave radio detection and ranging or radio detection and ranging or radiolocation or measuring instrument or measuring system or measuring device} signals that square measure mirrored back towards the transmitter square measure the fascinating ones that create radar work. If the thing is moving either nearer or farther away, there's a small amendment within the frequency of the radio waves, thanks to the propagation.

This constant speed permits the determination of the gap between the reflective objects (airplanes, ships or cars) and therefore the radio detection and ranging web site by measurement the period of time of the transmitted pulse. This energy usually travels through area during a line, and can vary solely slightly thanks to part and weather. By victimization of special radio detection and ranging antennas this energy may be targeted into a desired direction. So the direction (in angle and elevation) of the reflective objects may be measured. These principles will primarily be enforced during a radio detection and ranging system, and permit the determination of the gap, the direction and therefore the height of the reflective object.

One needs to resolve 2 issues with this principle:

- prevent an immediate association of the transmitted energy into the receiver (feedback connection),
- Assign the received echoes to a time system to be able to do run time measure.

A direct association of the transmitted energy into the receiver may be prevented by:

- Spatial separation of the transmission antenna and therefore the receiving antenna, e.g. the aim is light by a robust transmitter and therefore the receiver is found within the missile flying direction towards the aim;
- Frequency dependent separation by the Doppler-frequency throughout the measure of speeds. A run time measure is not necessary for speed gauges, the particular vary of the delinquent automobile does not have a consequence. If you wish vary data, then the time measure may be completed by a FM or part keying of the transmitted power. A CW-radar transmission associate un-modulated power will live the speed solely by victimization the Doppler- impact. It cannot live a spread and it cannot take issue between 2 reflective objects.

Correlation radar

The most vital radio detection and ranging utilized in this project is correlation radio detection and ranging whose operate is to produce the matching between transmitted and received signal and therefore the

matched signal is send to comparator for comparison the information Digital repose correlation operate is given higher than .The classical correlation is that the add of sample product X and Y, with Y being solely shifted in time. Zeros replace gaps within the shifted sequence.

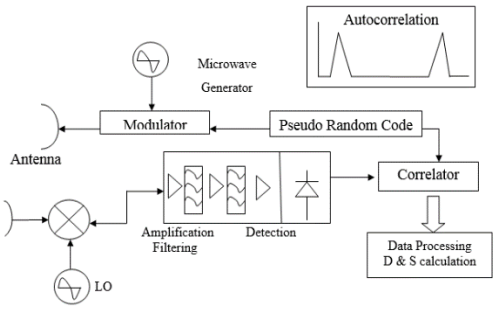

Figure 1 Block Diagram of Correlation Radar

We don't used classical correlation operate however a cyclic one is employed. Rather than a straightforward time shift the cyclic correlation perform a circular permutation of the second sequence.

Pseudo random sequence may be unipolar or bipolar. For unipolar sequence, chips will take the worth zero and one once a bipolar sequence will have values -1 or one. We used unipolar sequences and this sequence is generated by victimization register. Pseudo random binary sequences square measure generated victimization some specific outputs of the register's flip flops square measure fed-back via a XOR circuit. This feedback is completed so the register plays its (2n-1) attainable states, like n is that the variety of flip-flops forming the register. Thus, we tend to get what's known as a most length sequence.

$$C_{xy}(k) = \sum_{i=0}^{N} x(i)\, y\, (k+i)$$

Where Cxyis the correlation, *N* is the number of samples and *k* is the time shift.

II Past Work

Figure 2 represents the basic configuration of M Sequence radar. A single tone RF-clock pushes a shift register, which provides the stimulus signal, and a binary divider, which controls data acquisition. The shift register generates a PN sequence defined by its internal feedback structure. An M Sequence is a good choice in order to get a stimulus with a very short and clear auto-correlation function. Since PN sequences are of periodic nature, data acquisition can be undertaken by means of a sub-sampling technique, which drastically reduces the technical requirements of the receiver electronics. An M-Sequence is composed of 2*n*-1 chips and the binary divider takes care that after 2*m* signal periods, one data sample has been taken from every chip of the sequence.

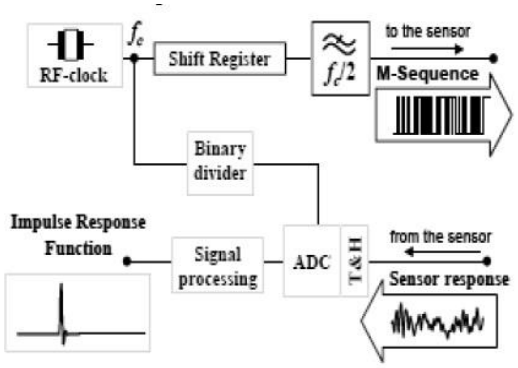

Figure 2 Basic M-Sequence concept using digital impulse
Compression.

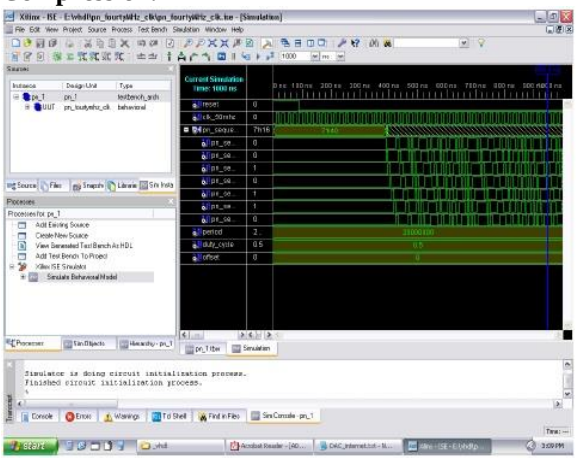

Figure 3 PN code implemented in FPGA

III PROPOSED WORK

The correlation Radar is style and simulated with VHDL and MATLAB to verify and validate the radar specification. The correlation Radar system incorporates transmitter and receiver. The transmitter incorporates delay block for providing delay up to a 1000 clk and code generator supported PN sequence and receiver section incorporates correlate which give correlation between 128bit of transmitted and receiver knowledge whose result's given to comparator that verify the output target and counter stop tally and therefore the distance between the two obstacle is verify. After verification is done by comparator and counter to be obstacle is too near about the system then the automatic braking operation perform by the system. The design diagram of correlate measuring system is shown in figure 4.

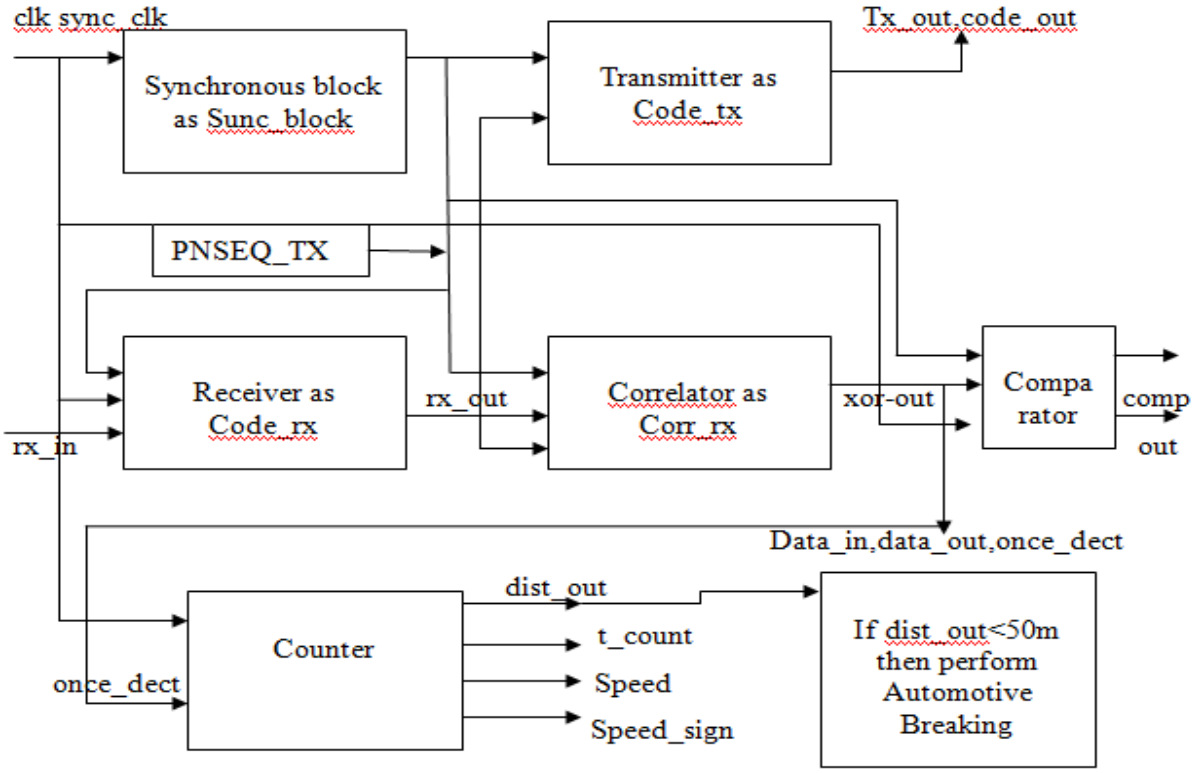

Figure 4 Block diagram of correlator radar used in Distance Measurement system

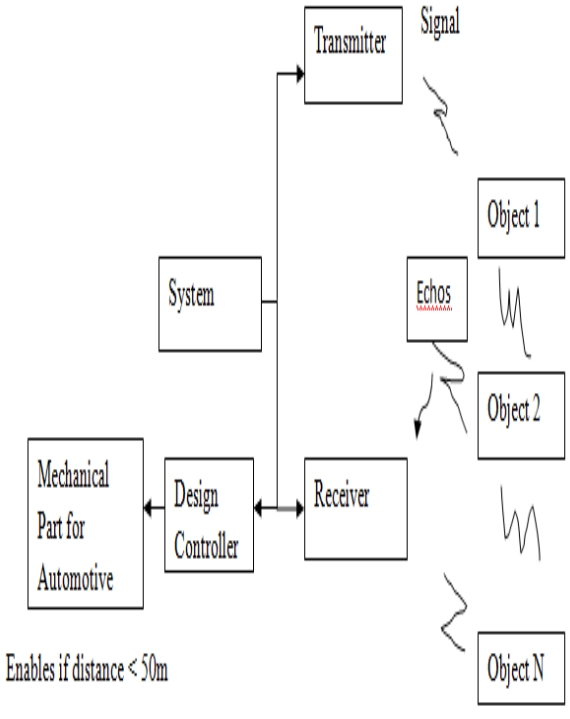

Figure 5 Block Diagram of Breaking Concept

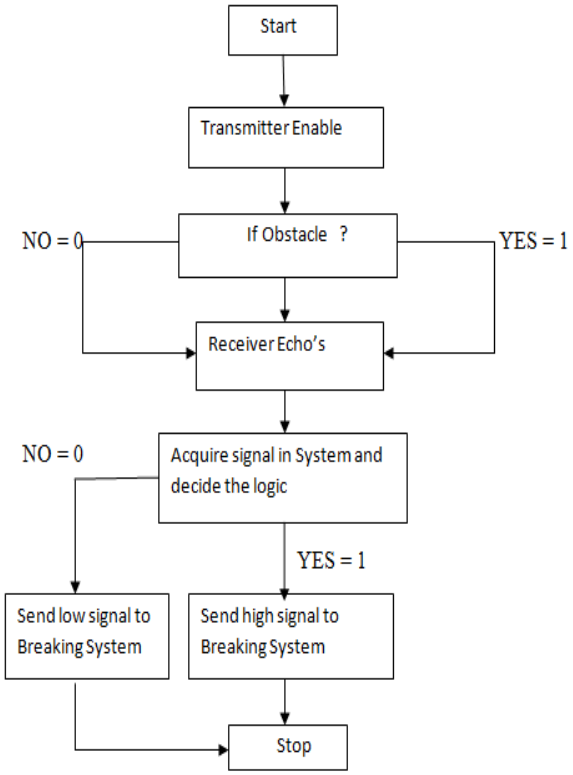

Figure 6 Flow Chart for Automotive System

Equation and VHDL codes (Function) used for each block of flow chart is given below

1. Open New Project
2. Write Code for synchronous block, Transmitter, receiver, correlator, comparator, counter, automotive breaking modules
3. Link all the modules to create correlation RADAR modules.
4. Now create RTL for correlation RADAR.
5. Write Test bench for RADAR.
6. Simulate the RADAR to observe distance, relative speed and speed sign and perform automotive breaking system if obstacle is too near by the system to avoid collision between two obstacles.
7. If obstacle is too near by the system like aircraft, submarine's and others perform automotive breaking operation and slow down the speed of the system like aircraft, submarine's and others according to relative speed, direction or speed sign and avoid collision.

Proposed MATLAB Algorithm

1. To clear all variable and command content to close all previously opened windows following MATLAB function are used.
2. clc
3. Clear all,
4. Close all,
5. Plot PRBS and GOLD sequence of 10 bit register length.
6. Plot PN seq 1 and PN seq 2 for PRBS and PN seq 1, PN seq 2, PN seq 3, PN seq 4 for GOLD sequence.
7. Add Noise to PRBS and GOLD sequence.
8. Correlate the PN seq 1 and PN seq 2 to get xor_sum-pn.
9. And again correlate PN seq 1 and PN seq 2 to get gs_seq-out and PN seq 3 and PN seq 4 to get gs_seq_out_1.
10. Correlate the result of gs_seq _out and gs_seq_out_1 shows gold sequence is better than PN sequence.

V RESULTS & THEIR DISCUSSION

Xilinx Simulation Results

Automotive breaking module basically based on correlation property of radar. Correlation radar consists of transmitter and receiver. This proposed methodology is a RTL and logical methodology which has implemented using VHDL code and Xilinxs 14.3 as a platform. In this proposal we synthesized the RTL module and their logical module and also enhance the compatibility and reduce the complexity. Simulation results have generated using Xilinxs 14.3 in their we synthesized nine module and determine obstacles distance, relative motion, direction, automotive breaking modules.

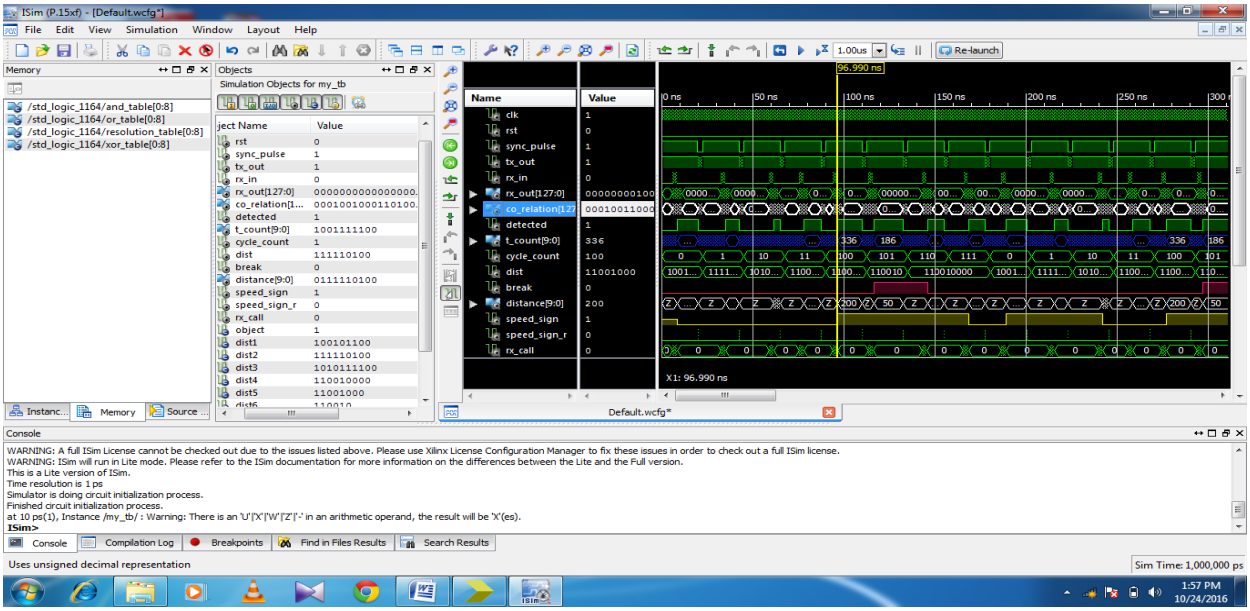

Figure 7 shows the correlation between transmitted and received signal

As shown in Figure 7 show that the correlation between transmitted and received signal when clock =1, sync pulse =1, with count 336 and obstacle is detected which is output of correlation radar.

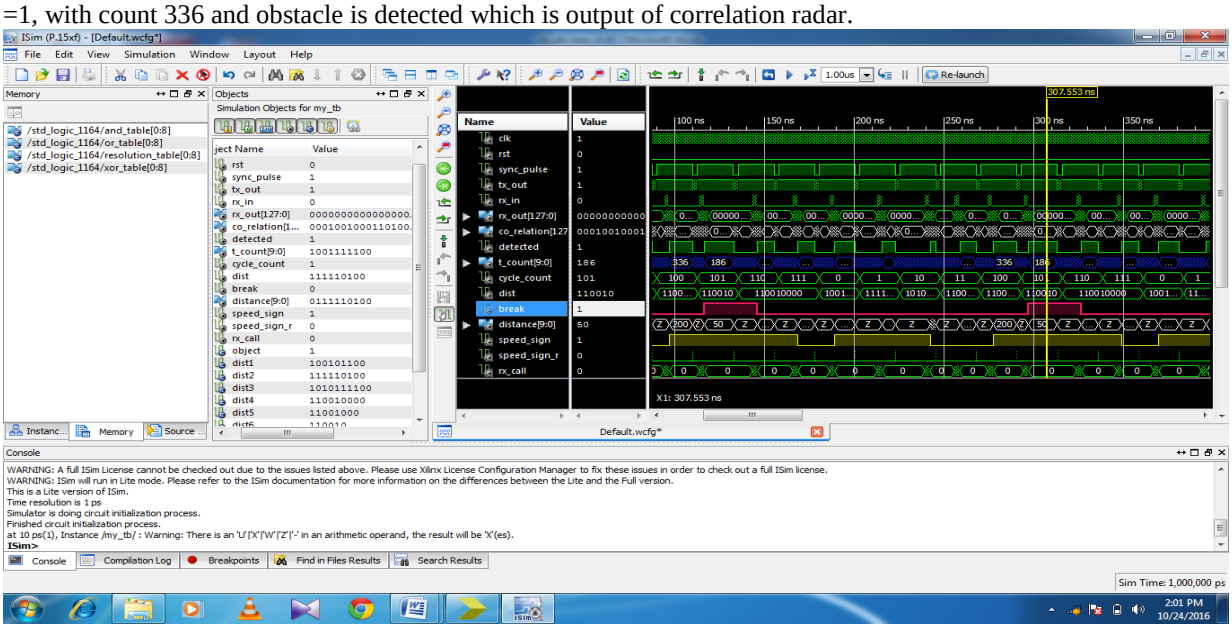

Figure 8 shows the breaking operation of the correlation radar

As shown in Figure 8 shows the output at clock =1, sync pulse =1, but receiver output is zero and correlation is obtained between transmitted and received pulse and distance is obtained at 50. Correlation is obtained between transmitted and received pulse at count 186, cycle count 101,tx_out =1, rx_in =0, and obstacles is detected and Obtained Output at correlation 307.553 ns with obstacle moving towards the system. Obstacle direction shows by the help of speed sign and this time it is 1, this shows that the direction and relative motion of obstacle towards the system. There is also system performing breaking operation and it can be seen by the help of break option, this time it has indicated 1. The system will slowdown automatically and avoid collision.

Matlab Simulation Results

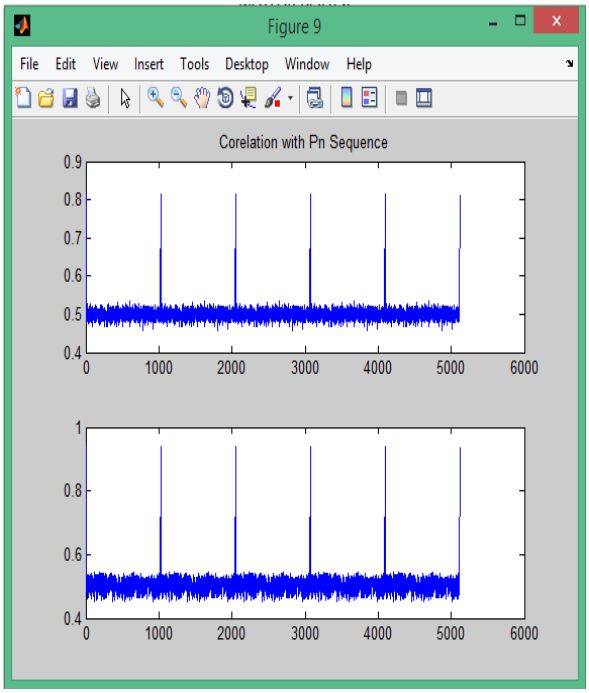

Figure 9 output of correlation with PN sequence and gold sequence

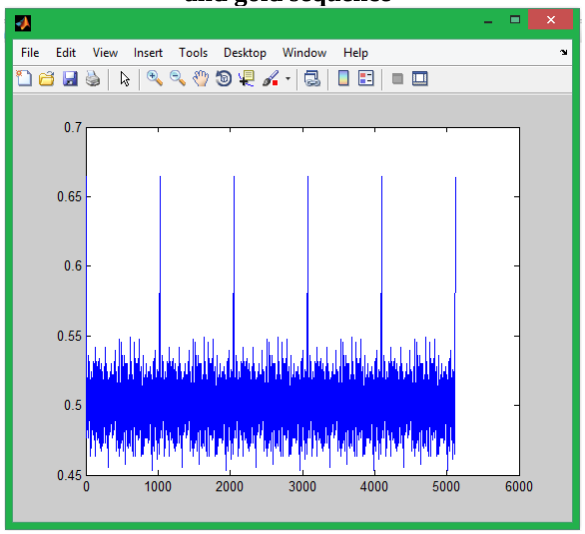

Figure 10 output of correlation with xor_gs_seq. of gold sequence

The above simulation results as shown in figure 9 and 10 are generated for 1024 bit long gold-sequence from the simulation results we can conclude that the

gold-sequence codes shows better auto correlation value even in presence of large noise in comparison with m-sequences also it shows no peaks with other gold-sequences which makes it better choice for automotive applications.

Some other important conclusions drawn by simulation are:

1 Greater number of sequences than m-sequences.

2 Good-sequence pairs have no peaks on cross-correlation values.

All the points mentioned above makes it a good choice for our system. Hence in MATLAB we can proof the mathematical concept of PRBS which is simulated by VHDL.

V Conclusion

In this paper we observe that we need a solution for detection in presence of noise as well in present of other signals & according to analysis of the simulation results shows that the gold codes gives better performance in presence of noise & other interfering radar signals although it needs larger number of gates hence its implementation on FPGA could increase the cost slightly but considering overall performance its better choice.

After a short state of the art on previous works car anti-collision systems, we havedescribed the principle of a distance measurement withcorrelation radar and gave our contributions on real timeimplementation of this radar.Many improvements were performed on the correlatorarchitecture. This concerns optimized multipliers andimprovements on adder layers.A particular attention was paid to our correlatorgenerator. The major interest of the latter is that it is ableto generate the VHDL code of the correlator including allits components, in an automatic way.

The next points give some advantages of the correlatorgenerator:

- Fast synthesis: correlator synthesis becomes very fastand easy (the generator executes in less Than a second),

- A flexible tool: to generate a new correlator, we onlyneed to enter the desired correlator parameters such asrandom sequence length or data bus width, etc.

- Robustness: if an error occurs in the synthesis, it ismuch more efficient and easier to fix it once on thecorrelator generator than to do it in each file of thewhole project.

The correlation was implemented on an FPGA for realtime application. Two tests were performed to check thegood functioning of the VHDL code generator and thecorrelator itself. In the second test a distance measurementwas performed. The results confirmed thegood functioning of the correlator and the correlator generator.

VII REFERENCES

1) Yuki NAKANISHI, Ryohta YANAGUCHI "A New Collision Judgment Algorithm for Pedestrain–Vehicular Collision Avoidance Support System in Advanced ITS" information Network laboratory in 2010
2) Pravin P Ashtankar,Sanjay S .dorle ,"Design Apporch For Anti-Collision Mechanism between vechicle to Vechicle for improving Safety operation in Intelligent transportation system in 2009
3) Hung Youpeng,ZhangHaibo,"Radar Infrared sensor Track Correlation Algorithm Using Gray Correlative Analysis" in 2009
4) Obstacle detection, obstacle avoidance and anti-collision system using a COTS multi-beam forward looking sonar proposed by Ken Teo, Kai Wei Ong and Hoe Chee Lai.in 2009
5) Lounis DOUADI*, Pascal DELOOF*, Yassin ELHILLALI "Real time implementation of reconfigurable correlation radar for road anti-collisionsystem" Institute National de Recherche sur les Transports et leurSécurité, LaboratoireÉlectroniqueOndes et Signaux pour les,in 2011
6) Chika Sugimoto, Yasuhisa Nakamura, Takuya Hashimoto"Development of pedestrian-to-vehicle communication system prototype for pedestrian safety using both wide-area and direct communication in 2008
7) L. Sakkila ,P. Deloof. Real time processing unit used for an anti-collision road radar system in 2006
8) C.Tatkeu,P.deloof,Y.Elhillai "A Cooperative radar system for collision avoidance and communication between vehicles" in 2006
9) Retro-directive Noise Correlation Radar with Extremely Low Acquisition Time Shalabh Gupta and E. R. Brown, Fellow, *IEEE* University of California at Los Angeles, **CA** 90095 in 2003.
10) M.LienardandP.Degauque "CORRELATION RADAR: An optimization of code generator architecture in 2003.
11) Pascal Deloof, jean-pierre GHYS " Radar system studied at INRETS to the road and Railway field" in 2002.

12) Jørgen Dall and Erik Lintz Christensen OrstedDTU,"Multiplier-free Filters for WidebandSAR" Technical University of Denmark OrstedsPlads, 348, DK-2800 Kgs. Lyngby, Denmark in 2001
13) Jing Changing*, Yang Xiaobo**An Front-end FMCW anti-collision RADAR No.4 Department of Chongqmg Communication Institute**Microwave Center of University of Electronic Science Technology of China in 2000
14) R.L.Walke, J.Dudley& D. Sadler "FPGA based soft radar with FIR filters" in 2000
15) Douglas.L.Perry "VHDL Programming by"Mc.Grawh.USA: Academic 2002.