

Single Spin Logic Based Designing of Decision Making Sub-System: A Case Study

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ABSTRACT: *The quest for UTB device in post CMOS era ushered drastic change in the world of electronics. One such promising candidate is the Single Spin Logic. It forms new world of electronics that precisely depends upon the spin-pseudo effect of electron rather than the charge of an electron. Incorporating this modus the author attempted to improvise SSL technology in man-machine interface engineering. A SSL based 'Decision Making Sub-System' nano ASIC is articulated here and the same is tested for functioning. The results are not only lying in proximity to the Single electronics made ASICs but it is quite speedy and robust. Moreover, it is wireless so that the issues of charge coupled devices are convincingly dealt with utmost efficiency.*

Keywords - *Single Spin Logic, MOSFET, Fabrication technique of SSL, Logic gates, Decision Making Sub System, CMOS.*

I. INTRODUCTION

Conventional electronics typically binded its maneuver within storing processing & transmitting information to charges of electrons or holes. This charge coupled devices are switched on and off by physically transporting voltage from high to low. Its motion creates consequently produces enormous dissipation.

SSL from its very inception augmented rapidly because of its unique spin interaction in neighboring electrons. Nearest neighbors exchange spins and thereby process information without involving charge or voltage. Classical binary bits 0 and 1 are categorically encoded in anti-parallel spin polarization confined in a single electron box [1]. Based on this two distinctive research has been ventured out in post-CMOS device research arena. Primarily researchers only put their mind and efforts to fabricate next generation spintronics. But the other half remain untouched. Since the dawn of the century are new paradigm that reckoned is Single Spin Logic where information processing is achieved by simply mobiling of an electron besides the charge.

Contemporary empirical studies on device shrinking revealed that at least 20% of consumed power is wasted as leakage power when the conventional MOSFET is less than 60 nm. Thus, these motivated researchers took to worldwide opt for a technological field so that probound alternate pathways to encode information can be adapted. One such striking research attempt was adapted by Dr. Supriyo Bandyopadhyay of Virginia Commonwealth University in 1994. He emphasized on the spin property of electron for information processing rather depending upon the charge of an electron. Off let the term spintronics was coined. Soon after researchers motivated themselves to incorporate spintronics technology in digital logic, thereby creating Single Spin Logic [2, 3].

Numerous Single Spin Logic based have been reputed scientific documents and reports. Being largely inspired by such novel topology the authors here propose a unique man machine interface technology that is to be used as a decision making subsystem is that it involves merely 8 electrons to perform a complex decision taking instance. When compared it with the conventional topology it required billions of electrons made several gates. Thus the operating speed is quite similar to electronic speed. This is undoubtedly a marvelous endeavor as advocated by the authors.

II. ANALYTICAL STUDY OF SSL

SSD evolved as a most successful and booming technology. It involves vast development in device study and depicts better figure of merit in nano scale electronic device technology even though it integrated a number of open challenges for the future generations.

III. SURVEY OF SSL SYNTHESIS

The fabrication technique of SSL has flourished gigantly as most of the researchers employed their brain and efforts in it and consequently several modern techniques have been reported so far. But the fragility is that the later way of research i.e., implementation of SSLs to create SSDs for real time circuit realization is still lagging far behind.

It is a high time to initiate broader research related to application areas of SSL such as Logic Gates, Memories and few more. Owing to such considerations researchers and scientists all over the world emphasize in designing new SSL based devices, consequently thousands of Single Spin Logic (SSL) based logic schemes have been reported so far. One such research initiative is reported here by the authors.

IV. SSL BASED MAN MACHINE INTERFACED DECISION MAKING SUBSYSTEM

Present day electronic researches has captivated human's decision making capability using logical interventions and topographies. Since decade long researchers aimed to improvise Single Spin Logic in designing future brain-mapping ICs. The strategy is to revolutionize the speed performance and device integrity so that all operations can be pioneered through one nano IC. Single Spin Logic possess all such merits and subsequently in the present context the authors aim to manipulate the same SSL in designing a spintronics IC to commensurate next generation decision making tool [4, 5].

The aim is to use this tool for policy choosing. The sequences of choosing a policy is depicted as follows:

1. A lady married after 18 years of age and she is now twenty five years old or over (X) or
2. She is under 25 years (Z) or
3. A male who is married and he's below 25 years and has not been met with any accident or
4. A married male who met with an accident (W) or
5. A married male whose age is 25 years or over and has never met with an accident (Y).

Considering all the pre-conditions the authors here demonstrate the SSL based above stated sub-system. The critical issues involved during designing were positioning the basic elements at the nearest level without any interference of the other elements [6]. For the sake of simplicity we have confined ourselves in only five conditions although more conditions could be added to it further.

For $W=X+Y'Z$ we get,

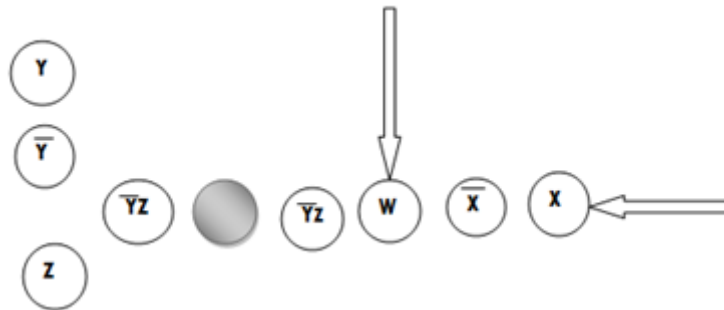


Fig1: SSL based Decision Making Circuit

Now to prove the eccentricity of the circuit let us consider any arbitrary instance-----X=0, Y=1 and Z=1, we have the following:

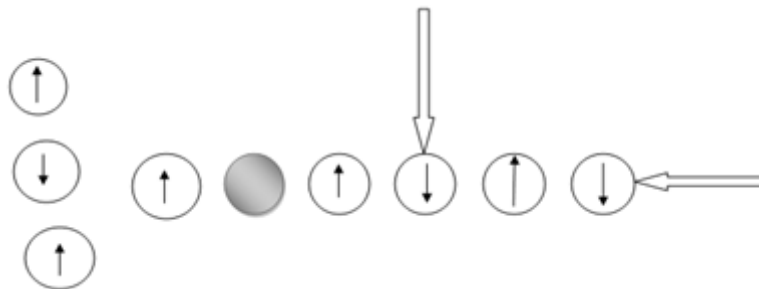


Fig2: SSL based value check of the Decision Making Circuit

V. CONCLUSION

The authors here adhere to the case study involving post CMOS era.SSL devices producing rapid change in electronics.SSD is likely to renovate the existing consumer electronics and high efficient system in the industry for the coming days electronics world. The authors are in absolute state of mind to mold complex logic circuits that are to be efficiently used in decision making subsystems. It is anticipated that they are similar advanced to human brains .Such models are to be considered as a hypothetical approach only for the time being as it requires more sophisticated lithography techniques to fabricate the same. But the fact is that such days are not so far. For easy understandings and compactness the circuit is kept simple. Other complexities can be integrated for enhanced performance.

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