Knowing that x depends on g and $x << d_0$ then, the simulation of sensitivity as a function of movable mass displacement is given in Figure.10:

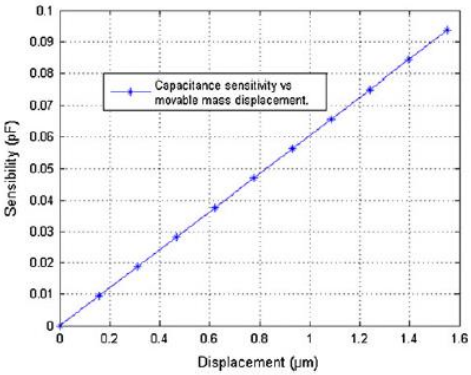

Figure.10.

We note that the difference in capacity is extremely sensitive at the minimum displacement of the mobile fingers that explains the effectiveness of the model.

10.3 Capacitance sensitivity S_c = f(g)

A graphics presentation of capacitance sensitivity as a function of acceleration with the 0g basis up to 5g, is shown in Figure.11.

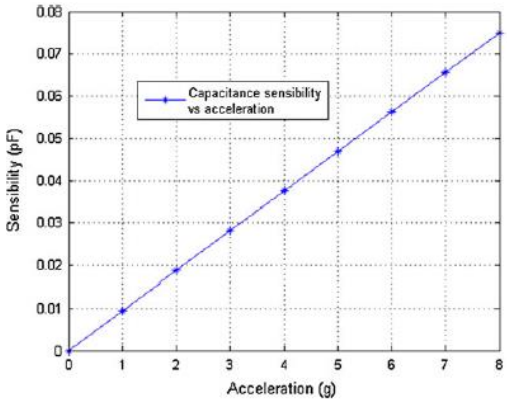

Figure.11.

It is clear that the accelerations increase implies an increase in the capacitance sensitivity S_c; this proves that one can count on this model to obtain a high precision sensitivity.

11. Conclusion

After the results obtained by simulation of some parameters accelerometer capacitive, we note that the geometry of the component such as the width and the length of the mobile fingers as those of spring take a very important role on the acceleration sensitivity.

Theoretically, we can narrow down the beam width W_b to achieve very high device sensitivity. However, there is always a bottom limit for the beam width set by the minimum line width in a fabrication process. If the beam width is too narrow less than 2µm, it will become very challenging to fabricate the beam because the beam is extremely fragile and can be easily broken.

Therefore, to obtaining a good performance and a good sensitivity of a capacitive accelerometer, it is necessary to choose better parameters such as the beam width and the beam length (W_b and L_b) which represents the suspension of the acceleration system.

Other share, the mobile fingers width and length (W_F and L_f) which constitute the capacities between the mobile fingers and the fixed fingers influence directly the value of these capacities then acceleration, which requires a choice very precise of these parameters.

References

[1] Huikai Xie and Gary K.Fedder; A CMOS Z-axis capacitive accelerometer with comb finger sensing, , Department of Electrical and computer Engineering and the Robotic Institute , Carnegie Mellon University, Pittsburgh, PA 15213-3890, USA.

[2] Hao Luo, Gang Zhang, L.Richard Carley, Fellow, IEEE, and Gray K.Fedder (2002). A post-CMOS micromachined lateral accelerometer. Journal of micro-electro-mechanical systems, vol.11. no. 3.

[3] Gang Zhang,B.S., Tsinghua (1994) Design and simulation of a CMOS-MEMS accelerometer, University, Carnegie Mellon University.

[4] Gang Zhang, Huikai Xie, Lauren E.de Rosset and Gary K.Fedder (1999), A lateral capacitive CMOS Accelerometer with structural curl compensation, Department of electrical and computer engineering and the robotics istitute, carnegie mellon university, Pittsburgh. PA15213-3890.IEEE 1999.

[5] Vishal Gupta and Tamal Mukherjeem. Layout synthesis of CMOS MEMS accelerometers. Department of ECE, Carnegie Mellon University, Pittsburgh, PA-15213.

[6] Kanchan Sharma, Isaac G. Macwan, Linfeng Zhang. Lawrence Hmurcik, Xingguo Xiong, Design optimization of MEMS comb accelerometer. Department of electrical and computer engineering, university of Bridgeport, Bridgeport, CT 06604.

[7] Cheng-Kuan Lu (2008). Wireless MEMS accelerometer for real-time. Department of electrical engineering and computer science, Case western reserve university.

[8] Babak Vakili Amini (2006). A mixed-signal low-noise sigma-delta interface IC for integrated sub-micro-gravity capacitive SOI accelerometers. School of Electrical and Computer Engineering ,Georgia Institute of Technology ,

[9] Xingguo Xiong (2005). Built-in self-test and self-repair for capacitive MEMS devices, Department of Electrical and Computer Engineering and Computer Science of the College of Engineering .