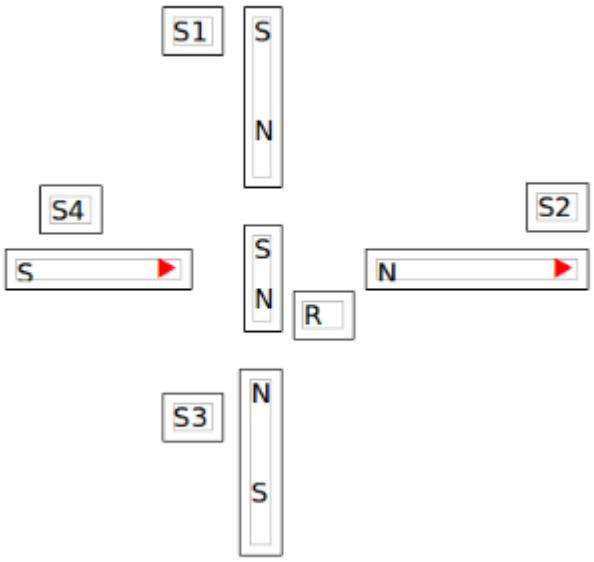
SRS (Software Requirements Specification)

Title: Stepper Motor Application using BeagleBone Black

Scope of the Application:

A basic stepper motor application consists of four magnetic stators placed in four directions and one rotor placed at the centre. Depending on the magnetic field produced by the stators the rotor rotates either in the clockwise direction or the anticlockwise direction at a particular angle. This angle and direction of rotation depends on the relative position of the stators producing the magnetic field. By placing four stators, we can obtain rotations of 45, 90, 135, 180, 270 degrees etc. Suppose the initial positions of the stators and rotor is as follows:



If S2 is turned on R will rotate clockwise for 90 degrees and orients itself according to the magnetic field. Similarly other rotations can be obtained by setting other stators on.

There are many applications of stepper motor some of which include :

Industrial Machines – Stepper motors are used in automotive gauges and machine tooling automated production equipments.

Security – new surveillance products for the security industry.

Medical – Stepper motors are used inside medical scanners, samplers, and also found inside digital dental photography, fluid pumps, respirators and blood analysis machinery.

Consumer Electronics – Stepper motors in cameras for automatic digital camera focus and zoom functions etc.

I) Functional Requirements:

1. Rotor should align itself in proper direction with respect to the generated magnetic field of the stators.
2. It should be able to deflect the rotor in 45˚, 90˚, 135˚, 180˚, 225˚, 270˚, 315˚, 360˚ in the clockwise as well as anticlockwise direction.
3. There should be proper interfacing between BeagleBone kit and stepper motor kit.
4. There should be proper interfacing between there BeagleBone ARM processor and the host machine processor.

I.I) Software Requirements:

a) Python including Adafruit Library.

b) Vim Editor

I.II) Hardware Requirements:

a) BeagleBone Black Board with adapter and power cable.

b) Stepper Motor Emulator Kit

c) Interfacing Cable

Non-Functional Requirements:

1. Scalability: We can add more number of scalar to obtain more deflection values like 22.5˚, 11.25˚etc.
2. Maintainability: The GPIO pins on the BeagleBone kit and the LEDs and other components when not functioning properly should be able to shoe error message.
3. Usability: The application should be user friendly.
4. Performance: The execution complexity of the execution of the program should be low in order to obtain least time lag.

Constraints:

1. This stepper motor application with 4 stators cannot produce deflections of angles other than the ones mentioned in the requirements.
2. If there is no proper interfacing between the BB board and the host machine the application will not work properly.

Conclusion: Thus the requirements and constraints of the stepper motor application were specified and documented.