VIT Chennai

Feb 2, 2024

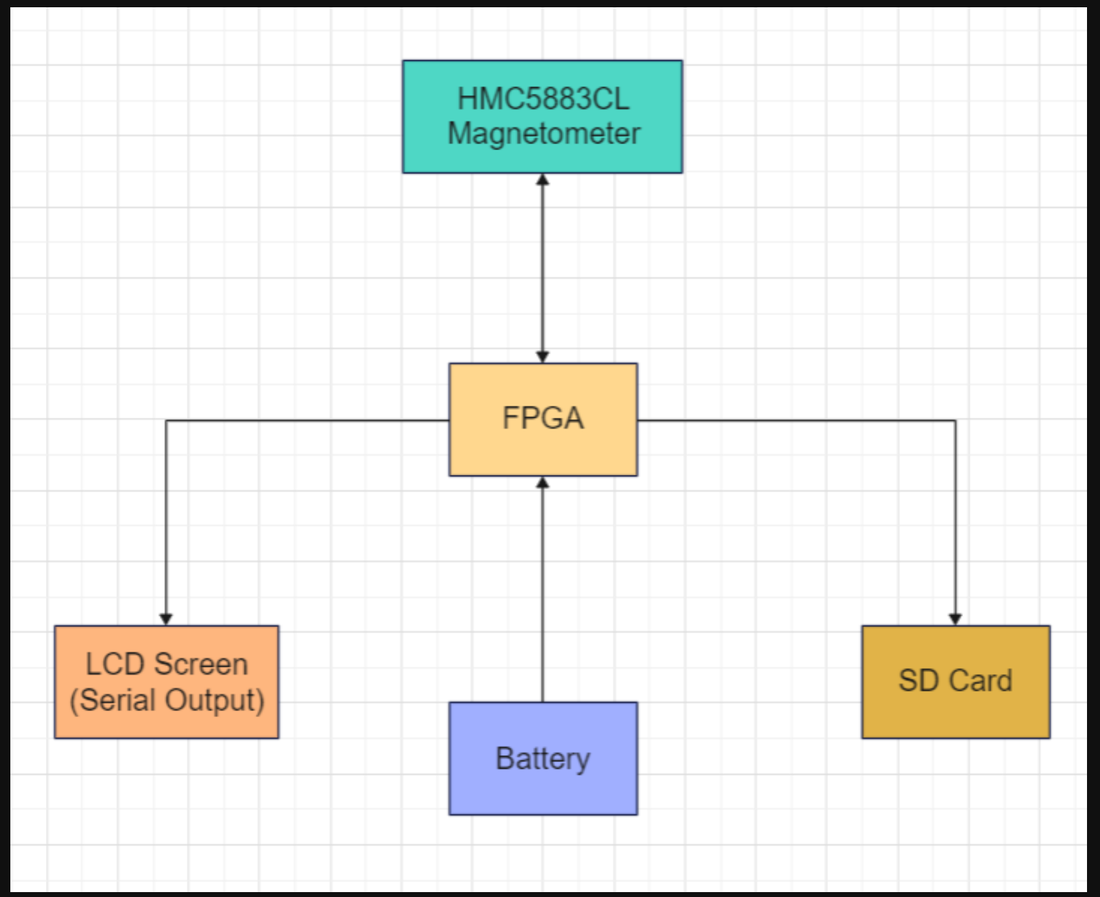
SOL-SAT

1st Review Capstone 2024

INTRODUCTION

The satellite will measure the fluctuation of the weak magnetic fields and calculate the Kp index of Earth. This will help us in monitoring the geomagnetic activity and help us predict the effect geomagnetic storms on the earth.

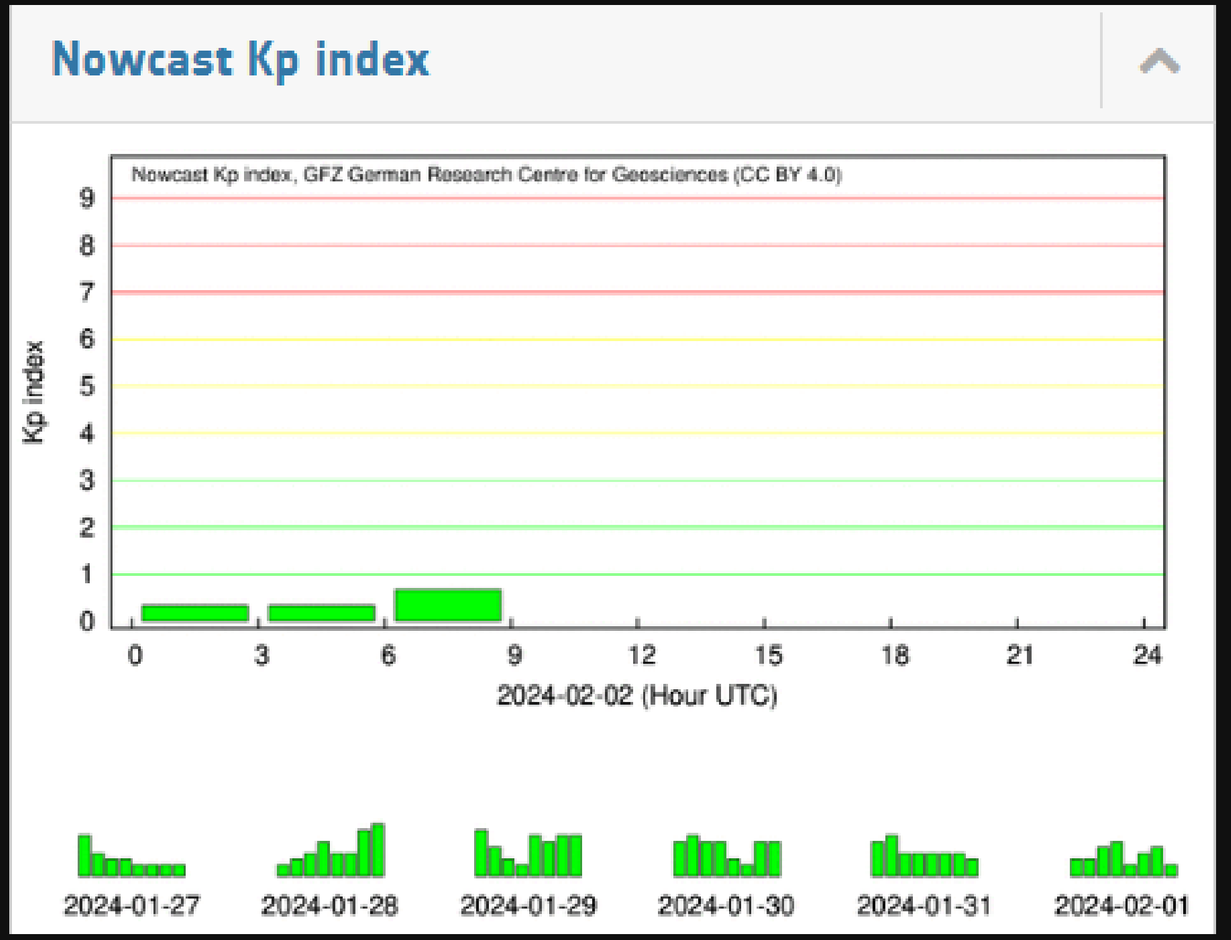
BLOCK DIAGRAM



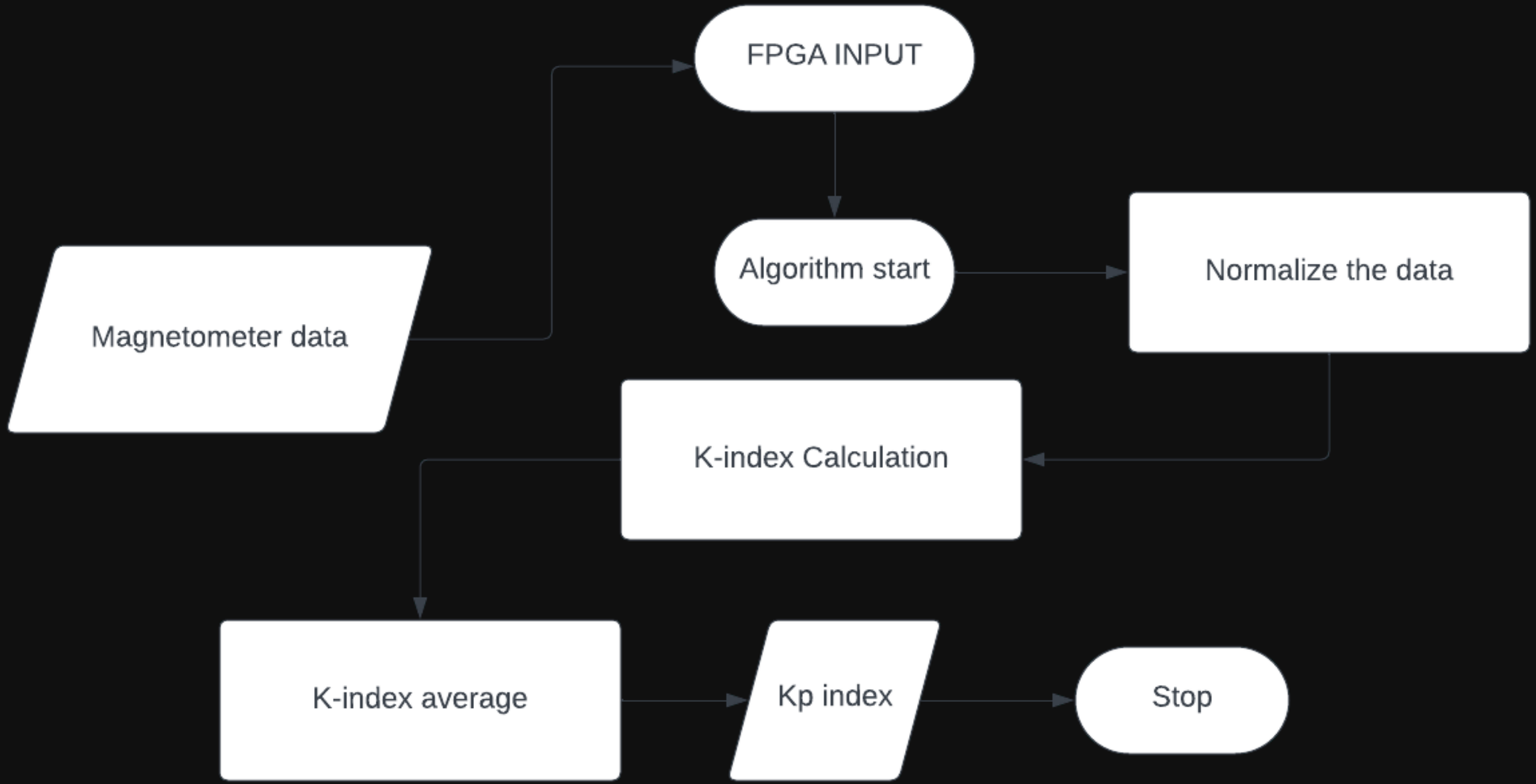
PARTS

- HMC5883L (Magnetometer)
- FPGA board
- Storage module
- Communication module

KP-INDEX


Nowcast Kp index
Nowcast Kp index, GFZ German Research Centre for Geosciences (CC BY 4.0)
Kp index
0
1
2
3
4
5
6
7
8
9
0
3
6
9
12
15
18
21
24
2024-02-02 (Hour UTC)
2024-01-27
2024-01-28
2024-01-29
2024-01-30
2024-01-31
2024-02-01

WORKING


FPGA INPUT
Magnetometer data
Algorithm start
Normalize the data
K-index Calculation
K-index average
Kp index
Stop

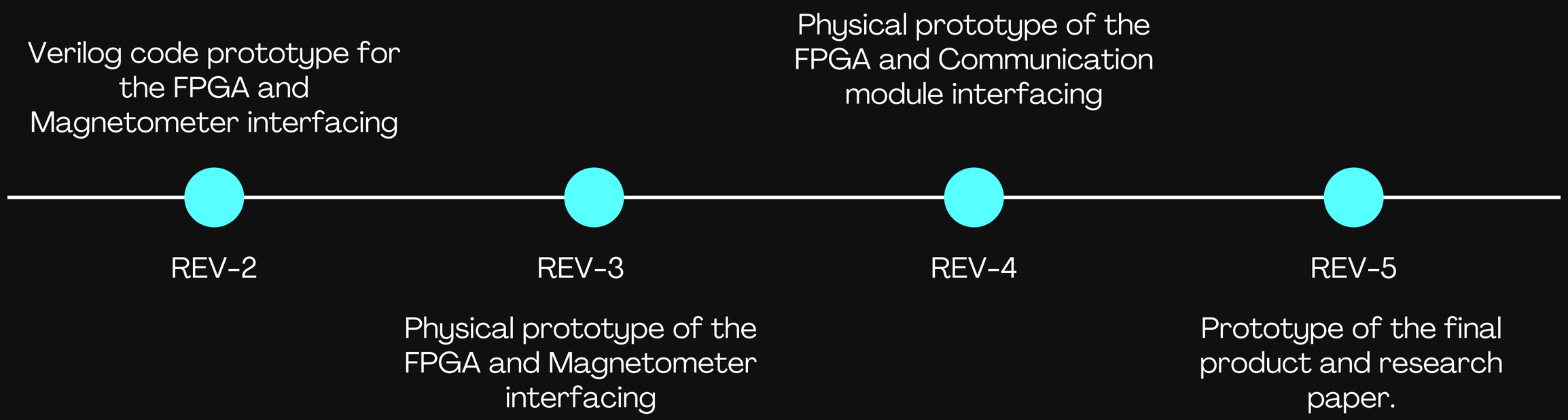
CALCULATIONS

1. Normalisation of the continuous data output from the Magnetometer.
2. Conversion of the raw data to K-index.
3. Averaging the K-index in a 3hour format.
4. Outputting the Kp index in csv file format.

FEATURES

- Low Latency
- Portable
- Ability to work with different file formats
- Parallel computing

ROADMAP


Verilog code prototype for the FPGA and Magnetometer interfacing
REV-2
REV-3
Physical prototype of the FPGA and Magnetometer interfacing
Physical prototype of the FPGA and Communication module interfacing
REV-4
REV-5
Prototype of the final product and research paper.

THANK YOU