

CHAPTER 5 – CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

- Based on data dissemination analysis for single, fixed, and float solutions, it is concluded that the most reliable data is fixed solutions because the standard deviation of the distance to the average point is smaller than the other solutions.
- Based on the experiment of elevation mask angle's effect on fixed and float solutions, it is concluded that the best elevation mask is 30° because it produces the most fixed solutions compared to the other elevation mask. This 30° will be used as the minimum elevation mask for the heading direction.
- Based on elevation angle and SNR analysis, it is concluded that the relation between elevation angle and SNR is proportional, therefore, satellites which have low elevation angle should be excluded since it contains more noise than actual signal.
- Based on the comparison of the number of satellites between two different satellites configuration, it is concluded that the constellation configuration GPS + Beidou + Galileo + SBAS + QZSS will be used in this thesis because it provides more satellite than the other one.
- The RTKNAVI application modification has been successfully done to exclude satellites based on the first and second elevation mask. The first elevation mask is used to filter the satellites in the heading direction. The second elevation mask is used to filter the satellites in the perpendicular heading direction.
- By analyzing the result of post-processed data using modified RTKPOST, it is concluded that by maintaining the same elevation mask in heading direction, which is 30° , and varying the elevation mask in perpendicular heading direction, when the elevation mask in perpendicular heading direction is increased until a certain value, the more fixed solutions that it creates.
- By detecting the rotary incremental encoder's waveform in an oscilloscope, it is concluded that calculation of pull-up resistor value must be done prior to designing the optimum electrical circuit for the rotary incremental encoder.

- By comparing two different Arduino instructions, it is concluded that by using `bitRead`, the processing time for Arduino ISR is 4 times faster than by using `digitalRead`.
- By detecting the edge of the rotary incremental encoder pulses as a signal to increase or decrease the rotary incremental encoder count value, the resolution of the counter becomes 4 times than the rotary incremental encoder pulse specification.
- By implementing safety validation software for the rotary incremental encoder, every time a failure occurs, the software will create notification immediately for the user.
- By implementing sleep function, the power consumed by the rotary incremental encoder system decreases by 36.08%.
- By implementing back up power supply mechanism, when the main power supply is suddenly cut off, the rotary incremental encoder count value will not be lost, since the power bank will immediately back up the supply voltage of the circuit.

5.2 Recommendations

For further development of RTK GNSS, additional research can be done about the adaptive elevation mask filtering to maintain the minimum number of satellites required for creating fixed solutions. In the current version (in this thesis), the settings for elevation masks is done manually and it can't be changed during the process of creating RTK solutions. Adaptive elevation mask filtering means that when the number of satellite is less than the minimum required, its value can alter automatically to create the desired solutions.