

# Smartphone Indoor Localization: A Sensor Fusion Approach

Seamless indoor localization of smartphones  
without use of external hardware devices

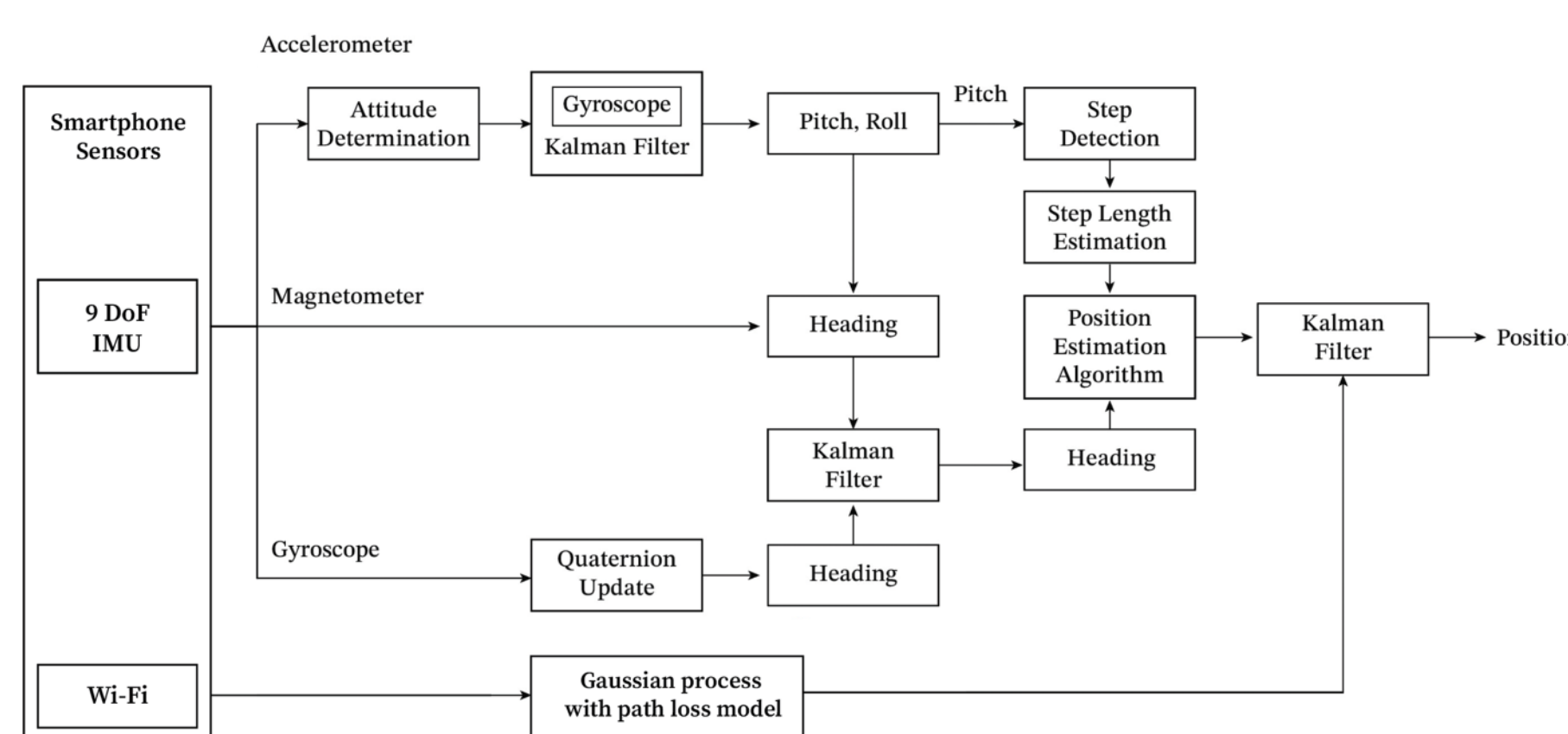
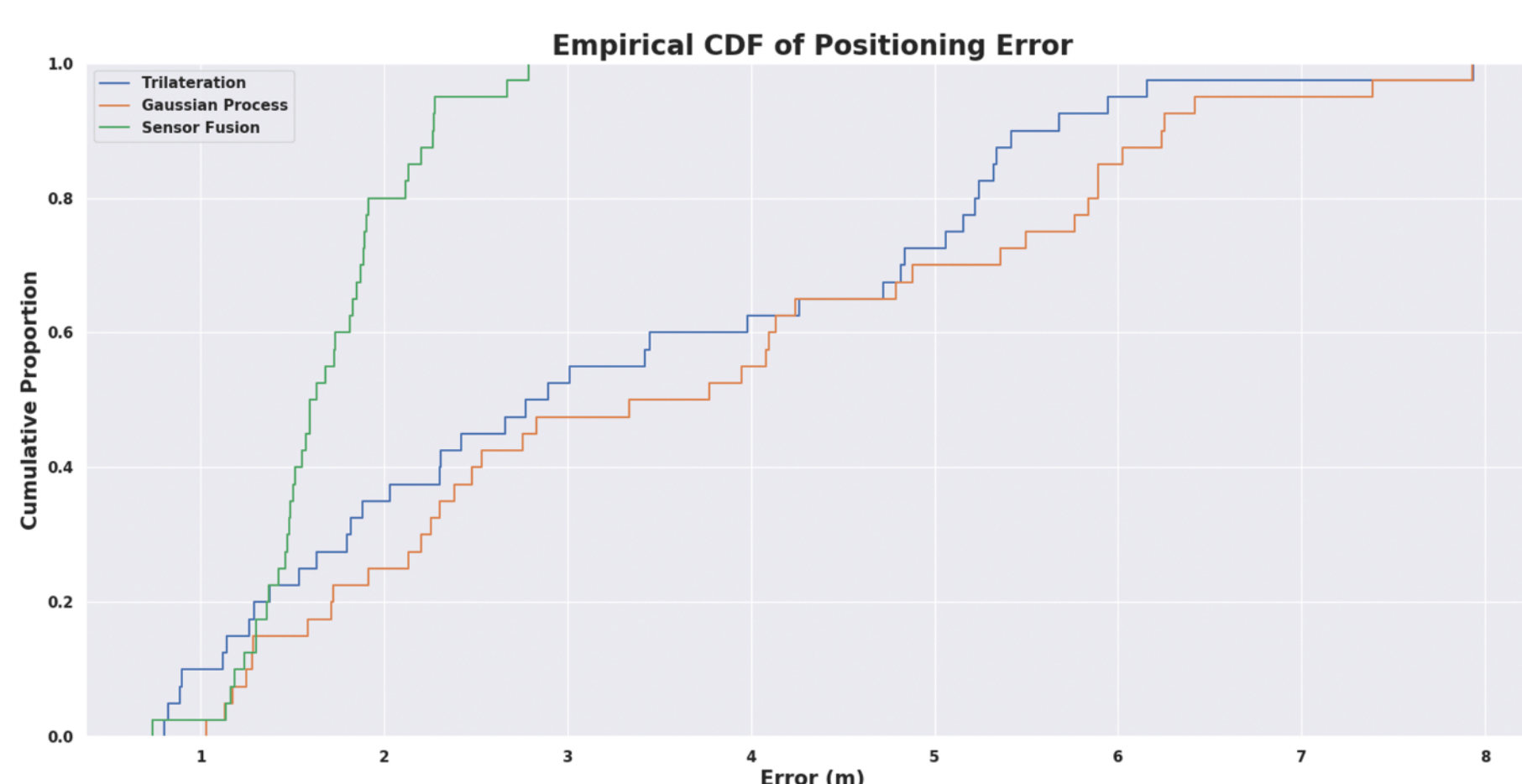
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## PROJECT SUMMARY

Unlike Global Positioning System (GPS) based localization for the outdoors, there exists no de facto standard for indoor localization due to practical limitations. However, accurately determining the position of a device in an indoor environment is becoming more important due to the increased use of mobile devices. Wi-Fi signal strength based positioning is a popular approach, because most indoor spaces already have Wi-Fi deployed. However, position estimates from signal strengths can be inaccurate due to environmental influences. In this project, we propose the use of Gaussian process regression models to learn those environmental effects, and generate more accurate position estimates. Furthermore, we integrate this method in a sensor fusion framework using pedestrian dead reckoning (PDR) - a method of generating relative trajectory from inertial measurement units (IMU) - using Kalman filters. We conduct our experiments in an indoor office environment, and demonstrated that the sensor fusion approach performs better than the positioning algorithms using the individual modalities.

## REFERENCES

- [1] R. Miyagusuku, A. Yamashita, and H. Asama, "Precise and accurate wireless signal strength mappings using gaussian processes and path loss models," *Robotics and Autonomous Systems*, vol. 103, pp. 134–150, 2018. doi: 10.1016/j.robot.2018.02.011. [Online]. Available: <https://www.sciencedirect.com/science/article/pii/S0921889017303925?via%3Dihub>
- [2] A. Poullose, J. Kim, and D. S. Han, "A sensor fusion framework for indoor localization using smartphone sensors and wi-fi rssi measurements," *Applied Sciences*, vol. 9, no. 20, 2019, issn: 2076-3417. doi: 10.3390/app9204379. [Online]. Available: <https://www.mdpi.com/2076-3417/9/20/4379>.

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