Radio Frequency Based Multi-Source Positioning in Indoor Environments

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Overview

This work presents a radio frequency (RF) based multi-source automatic indoor positioning system by simultaneously using broadcast FM radio & GSM signals for position estimation.

Explanation

Accurate positioning is important for efficient operation of unmanned aerial systems (UAS). Though modern UAS depend on the Global Positioning System (GPS) for outdoor operations, there is no accepted standard for indoor positioning that is equivalent to the Global Positioning System (GPS). It is not possible to use GPS for indoor positioning as it is unreliable in indoor environments, due to large scale signal attenuation and noise due to multi-path. This work provides a generalized framework for building an indoor positioning system using Signals of Opportunity (SoO).

Methodology
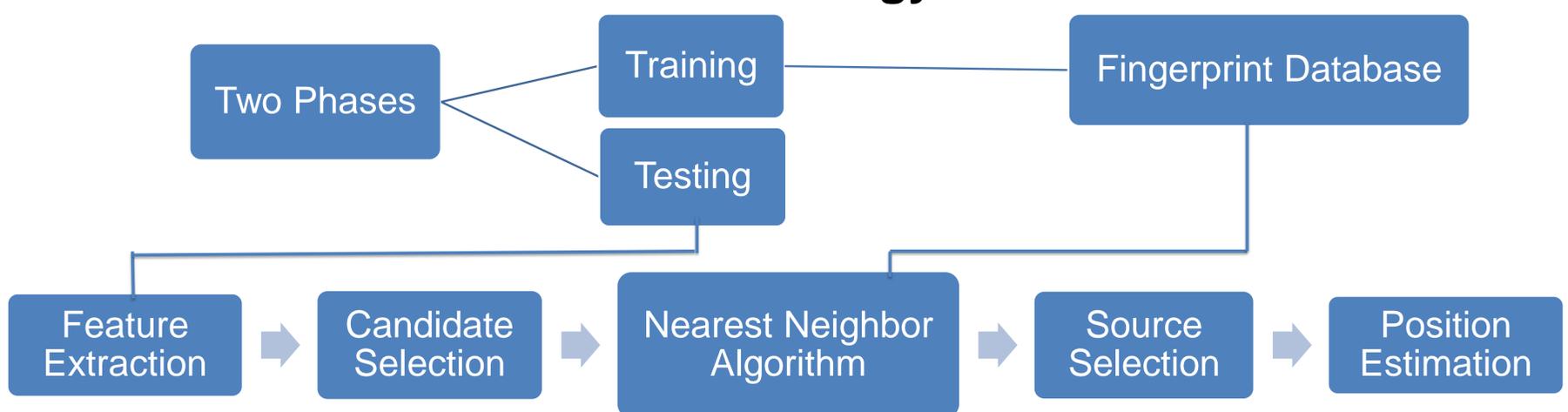
Results

We used our system for positioning with the well known AMBILOC dataset. The fingerprint database was built using signals collected in the month of January and tested with data from all the months (January - December). Using our framework we were able to localize *exactly for* approximately 98.3% (varying from 95.49% to 100% across the year) of test locations and hence shows the *transfer learning* capability of our system.

Conclusion

We have demonstrated a generalized framework for building indoor positioning systems using signals of opportunity. Our system is robust to changes in signal features across time and provides a pluggable framework for building robust indoor positioning systems having both civilian as well as military applications.

Acknowledgements