Paper Review: Multi-Touch in the Air: Concurrent Micromovement Recognition using RF Signals

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1 Summary

The authors propose an RF glove.[1] . They achieve an accuracy of 92.1%. They use many novel methods such as a 3D Positioning Model and an RF Micromovement Model. The movements are compared with Phase Profiles in the form of matrices and they are able to narrow down the exact gesture as well as the individual finger movement with great accuracy.

2 Salient Features

The paper is well structured. Each section begins with a detailed introduction about what the section contains. They also introduce methods followed in the order in the section. Mathematical expressions have been well derived. They also use a lot of specifics in terms of measurements. This helps in reproducibility. Complex diagrams are also well explained which helps in visualization.

3 Negatives

In general, the paper suffers from Excessive Repetition. This increases the length of the paper unnecessarily and effects its conciseness. There are claims or assumptions made at some places which are not referenced or explained. There is at least one typo at a crucial point in *"Reconstruct Template Phase Profiles Based on Location"*. Dynamic Time Warping (DTW), which is crucial to the functioning of the glove, needs further elaboration.

4 Technical Feedback

They have considered varying parameters and conditions and measured the robustness in all these scenarios.This enables us to gauge the optimal working conditions for the product. They also do not mention Future Scope and hence continuing on their research may be challenging.

1. Potential Scenario: The authors explore the possibility of putting an additional tag on the arm for more accurate tracking. This problem is not apparent to the reader unless it is brought up by the authors. Mentioning it shows good foresight on their part. However a missed potential scenario would be to test the device when the LOS view between the glove and the antennas is obstructed.
2. Reproducibility: They use off the shelf equipments. They have also given us specific conditions used in their experiment and hence if needed, it should be easy to reproduce. However, they do no give us any references to the pseudo code. Instead of that they give us a block diagram of the system overview.
3. Believability: They have tested their devices multiple times with volunteers which makes their observations believable in general and not just an exception. Providing performance results with both macro and micro benchmarks also helps with the same. Comparison with existing similar final products as well as individual methods is done.

References

[1] Lei Xie, Chuyu Wang, Alex X Liu, Jianqiang Sun, and Sanglu Lu. Multi-touch in the air: Concurrent micromovement recognition using rf signals. *IEEE/ACM Transactions on Networking (TON)*, 26(1):231–244, 2018.