Demo: HomeMeld: Co-present Robotic Avatar System for Illusion of Living Together

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1. INTRODUCTION

Real-time remote interaction in work-separated families has become easier and richer by recent advances in mobile computing, yet it is still far from achieving a sense of living together. Imagine family members living apart are mutually *co-present* in each other's home with their avatars that all the activities and movements are intelligently mirrored in the other's living space. Such co-presence brings many pseudo living-together experiences, which are incomparable to those of today's remote face-to-face communication. We develop an initial prototype, HomeMeld[1], a device-free self-mobile robotic system serving as a real-time, co-present avatar to create an illusion of living together. HomeMeld is built on top of a commercial telepresence robot hardware [1] and a CNN-based computer vision technique, letting a person be device-free at all times as like as she is at home. In this demo, we present the motivation behind our work, the end-to-end operation of HomeMeld, and the vision of giving a sense of living together to the family living apart.

2. TECHNICAL CHALLENGES

The first step towards realizing HomeMeld is to reproduce remote user's location and orientation in local user's home. A challenge to this is the spatial heterogeneity between the two homes, e.g., different floor plans and furniture arrangements. We define a notion of *functionally equivalent location and orientation* which is computed with respect to one or more prominent in-home objects. Being close to the object and looking at the object are strong indicators that the user is using and interacting with the object. Reproducing remote user's contexts with location and orientation with respect to the functional objects in local user's home is a natural and reasonable approach in our case.

Our mapping approach, namely object-oriented mapping, partitions the given home space into several regions each of which encloses a functional object (e.g., Voronoi diagram). Then a point in Home A is mapped into a point in Home B by finding an equivalent polar coordinate of the mapped point with respect to the functional object being considered (e.g., scaling the distance to the functional object at the equivalent relative angle towards the object). This approach was found to be effective for generating continuous trajectory of the mapped points within an area close to a functional object. The full paper [2] presents the motivating study of HomeMeld and technical challenges including mapping between heterogeneous homes and navigating the robot to reflect the remote user's presence in real time.

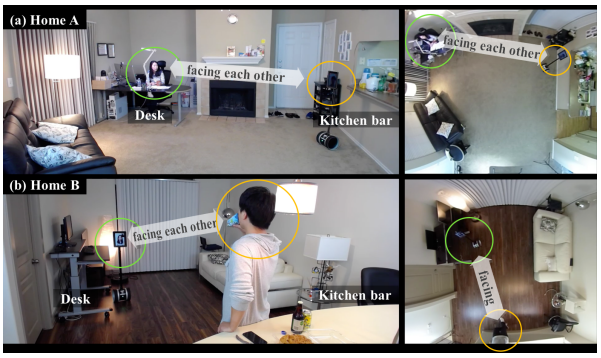

Figure 1: Example snapshot of HomeMeld video

3. DEMONSTRATION

In the demo venue, we will demonstrate HomeMeld in a form of video mainly due to the logistic challenges with shipping and reproducing our large setup. The video will be a comprehensive showcase of HomeMeld in real settings involving two large living spaces, two human-sized robots, and real family members. The video will present end-to-end operations of HomeMeld; Figure 1 shows an example snapshot. The video will also highlight how our mapping strategy works across heterogeneous floor plans by leveraging the notion of functionally equivalent location & orientation.

4. ACKNOWLEDGEMENTS

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5. REFERENCES

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[2] B. Kang et al. My being to your place, your being to my place: Co-present robotic avatars create illusion of living together. In *Proc. MobiSys'18*. ACM, 2018.

[1]Our video is available at: https://goo.gl/avF5Ji

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