This work tackles the problem of automated indoor floorplan construction. To accurately construct an in- door floorplan, a set of indoor features are required, including

(1) unique identification of individual rooms,

(2) estimated room geometric information, e.g., length and width, and

(3) geometric relationship among rooms.

• Heterogeneous indoor environments: An indoor environment consists of rooms with diverse sizes. Room connections through hallways also vary significantly. Such heterogeneous indoor environments make accurate floorplan construction challenging.

• Noisy Wi-Fi fingerprints: Due to the complex multipath propagation problem, Wi-Fi fingerprints obtained by mobile phones are dynamic and noisy. The problem is particularly challenging when using Wi-Fi fingerprints to determine detailed floorplan features.

• Mobile crowd sourcing: Leveraging the built-in motion sensors of the mobile phones carried by occupants, “crowd sourcing” offers a potentially highly scalable solution for automatic floorplan construction. The primary challenge is how to accurately extract stable and representative floorplan structure from diverse and random occupant motion patterns.

In this work, we propose an automatic indoor floorplan construction system. Leveraging Wi-Fi fingerprints and user motion information collected via mobile crowd sourcing, the proposed system extracts indoor floorplan features, including room identity, geometry, and inter- room geometrical relationship, and then construct the indoor floorplan automatically. To tackle the aforementioned challenges, the proposed system uses the following main components.

• A room adjacency graph construction algorithm that identifies the adjacency of rooms and constructs a room adjacency graph that is robust to the spatial bias of room fingerprints and Wi-Fi noise;

• A hallway layout learning algorithm that determines the room arrangement along each hallway, e.g., room sizes and orders, using crowd-based motion sensing on smartphones; and

• A force directed dilation algorithm that adjusts the indi- vidual room structures globally to improve floorplan accuracy.