

## 博士論文審査結果の要旨

博士論文審査委員会

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| 氏 名   | Nur Safwati Binti Mohd Nor  |
| 論文題目  | Automatic Initialization System for Home-based Robotics Service Environment |
| <p>〔論文審査の要旨〕</p> <p>予備審査における以下の指摘事項、</p> <ul style="list-style-type: none"><li>(a) 研究のフィロソフィを明確に述べ、ストーリーを展開すること</li><li>(b) 「初期化」の定義を丁寧に説明すること</li><li>(c) 自動化部分と人が関与する部分を分けて述べること</li><li>(d) 研究のコアである方法と実験の説明を詳細化すること</li><li>(e) 目的と結論との対応を明確にすること</li><li>(f) 発表と論文の構成の対応を取ること</li><li>(g) 単純なミスタイプを直すこと</li></ul> <p>に従い、内容を充実するとともに、推敲・改善した。この間、原著論文、国際会議に投稿し、博士論文内容と構成に反映した。</p> <p>本審査は、2014年8月2日豊洲校舎305教室において、10:30~11:15 プレゼンテーション、11:15-12:25 質疑を実施した。本論文記載内容に関して、</p> <ul style="list-style-type: none"><li>(1) プレゼンテーションの表記と整合を取ること</li><li>(2) 研究の位置づけで、フィロソフィをさらに明確に述べること</li><li>(3) 本文中の図の文字が判読しにくいところ、編集上の誤りを精査し、修正すること</li><li>(4) 水川研の空間知研究と本研究の関係の整理とアルゴリズムの詳細を説明することを指摘の上、審査投票をおこない、全員一致で合格とした。</li></ul> <p>本博士論文に関わる業績は以下の通りであり、課程博士の学位授与要件を満足している。</p> <ul style="list-style-type: none"><li>(1) 原著論文 2編</li><li>(2) 査読あり国際会議 5編</li><li>(3) 査読無し国内会議 1編</li></ul> |   |

# 論 文 要 旨

## Thesis Abstract

2014 年 7 月 2 日

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| ※報告番号  | 甲 第 161 号 | 氏 名<br>(Name) | NUR SAFWATI BINTI MOHD<br>NOR |
| 主論文題名 (Title)<br><b>Automatic Initialization System for Home-based<br/>Robotics Service Environment</b>  |           |               |                               |
| 内容の要旨 (Abstract)<br><p>This research introduced an initialization system for robot service in order to support human daily-life activities at every individual home environment. Nowadays, robot service has become significant solution to the rising of elderly people in the sense that robot may help to ease or support their daily routines at home such as bring an object from one place to another or tidy-up the living space as well as storing the objects to the right place. Because of elderly people mostly spend their time at home daily, service robot is expected to co-exist with human so that robot can give assistive service to them. However, robot has to acknowledge the information embedded in the environment itself before introduce the robot service at actual 3D spaces. For instance, information on furniture location and arrangement at home may help the robot to perceive and recognize the object's location that is located on or near the furniture surface. By using sensors attached to the objects in order to identify object's location and along with service robot system itself, it is time and cost consuming to setup database of the first seen environment. This is one of the essential issues of daily life service robot. If the furniture's information can be initialized before introducing robot service, it would be easy and effective to demonstrate it at first-seen environment which suits individual life-styles.</p> <p>Apparently, vision technology is one way for robot to understand the environment thus obtain required information related to robot service. By using robot-mounted camera, the images for an environment can be analyzed by employing image processing technique. For example, the 3D information of objects in the living environment can be acquired from the point cloud data that is generated by depth camera. The usefulness of these point cloud data for robot service is that it</p> |           |               |                               |

represents the external surface of an object. In other words, the point cloud is able to describe the shape and corners for objects like furniture in the living space. Meanwhile, exact furniture dimension is crucial whenever to generate robot service to human safely. A reference database which has the actual furniture 3D structure can be used as the information sources thus confirm on the estimation measurements from depth camera. Online database like furniture catalogue contains complete information about a product such as color, size/dimension and assembly instruction. Since online catalogue is updated regularly, it is easy and appropriate to be referred to. As a result, robot is able to perceive human 3D space according to their living lifestyles and preferences especially on the furniture list.

Therefore, by using above ideology, this research is proposing to initialize the first-seen human living environment which implementing consumer-level depth camera such as Microsoft Kinect Xbox as well as the floor layout software, Microsoft Office Visio. The result showed that this initialization system is able to give several number of candidates for the furniture based on its category such as sofa, TV bench and so on from the online catalogue. Besides, this research also develops a system plug-in to link the information from depth camera and online catalogue in one platform for building up the 3D individual environment model.

Finally, the method presented in this dissertation may benefit the robot service by need not to measure furniture dimension to get its physical 3D attributes since information such as size and number of drawers can be automatically extracted from the furniture catalogue. In addition, this initialization system could be a basis to many robot service applications and provide assistive service at every home easily and successfully.