

博士学位論文審査要旨

2019年 1月 15日

論文題目： Design of Relationality to Enable the Vitalization of Resident-centered Communities

(住民主体の地域活性化を可能とする関係性デザインに関する研究)

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要 旨：

本論文は、ヒト・モノ・コトを要素にそれらの関係性から成るシステムとしてコミュニティを捉え、住民主体の地域活性化を可能とする関係性デザインとその有用性について論じている。人口減と高齢化が進行するなか地域コミュニティの活性化とそれを持続可能とする仕組みづくりが求められている。

本研究は、人々の自発的関与なしには成立しえないコミュニティというシステムを対象に、地域住民が日常生活を営むなかで自然に生み出すヒト・モノ・コトとの関わりを住民一人ひとりが獲得する関係資産として定量化・可視化し、関わりへの気づきとインセンティブを喚起することによって、住民自らが関係資産を維持・運用する持続的な仕組みを提案している。具体的にはシミュレーションによるモデル研究とフィールドでの実証実験を有機的に組み合わせて研究を展開し、資産性がヒト・モノ・コトの関わりの形成促進に効果があることを確認している。

またフィールド実験で収集したデータのネットワーク分析を通じて、ヒト・モノ・コトとの関わりを媒介する場所概念としてのメディア・スポットを推定する手法を構築し、住民へのヒアリング調査と照合して推定手法の有効性を確認している。さらに地域活性化には地域課題の発見が第一歩となるが、関係性データの分析の結果から地域課題の発見には住民の行動変容の促進が効果的であることを明らかにしている。

本論文は、住民主体の地域活性化に向けた関係性デザインの方法論に関する先駆的かつ実用的な研究であり、これらの成果はこの分野の発展に多大なる貢献をなすものである。よって本論文は博士（工学）（同志社大学）の学位論文として十分な価値を有するものと認められる。

総合試験結果の要旨

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要 旨：

論文提出者は理工学研究科情報工学専攻博士後期課程に在籍している。本論文の主たる内容は J. of Control, Measurement, and System Integration, Vol.11, No.2, Artificial Life and Robotics, Human Interface and the Management of Information 等に掲載され、十分な評価を得ている。

2018年12月22日13時から1時間20分にわたって提出論文に関する学術講演会(博士論文公聴会)が開催され、種々の質疑討論が行われ、論文提出者の説明により十分な理解が得られた。さらに講演会終了後、審査委員により論文に関連した諸問題につき口頭試問を実施した結果、十分な学力を有することが確認できた。

提出者は、英語による論文発表や語学試験に合格しており、十分な語学能力を有すると認められる。よって総合試験の結果は合格であると認める。

博士學位論文要旨

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要旨：

Japan faces two serious problems; an inevitable super-aging society and an abrupt decrease in population. These problems are causing some people being left behind, isolated, and alienated from their community/society. This phenomenon is particularly evident in communities. Thus, rebuilding and sustainably managing communities have become imperative.

A community is a system that cannot exist without the self-motivated involvement of community members, and it is composed of humans, “Mono,” “Koto,” and their relationality with each other which are naturally formed by community members during the course of their daily lives. Relationality among humans, “Mono,” and “Koto,” that are formed between members in a community on a daily basis should be regarded as an asset in the sense that relationality can be considered as social and economic value expected to provide some benefit to the community in the future. The focus of this dissertation is to postulate relationality as an asset that community members earn individually, and to elicit their awareness of relationality as trust.

For rebuilding communities, in this research, we aim to quantify and visualize the relationality between humans, “Mono,” and “Koto,” in a community as relationality assets, develop an awareness of the significance and meaning of relationality in a community, and provide an incentive to members of a community to develop relationality, so that they themselves can manage, sustain and enrich their community through relationality.

Hence, an integrated approach to combine modeling and practice has been applied as follows: We examined simulation models of relationality assets to theoretically establish relationality assets. In addition, to investigate how the approach for designing the proposed mechanisms and verify their effectiveness, we have conducted fieldwork with residents in a community for several years. For modeling, we built simulation models using system dynamics (SD) and a multi-agent system to investigate how the proposed mechanisms work and influence the behaviors of the community as a system. These models were then refined by proof-of-concept in the field.

In the field study, we built an activity data collection platform for resident-centered community vitalization, which is compatible with terabyte class data collection. The activity data includes location information, sending and receiving emails, telephone reception and transmission, and Bluetooth data obtained while residents passed by each other. The number and frequency of passing-each-other occurrences between individual residents are analyzed, normalized, and represented as a graph. Through users' evaluation, we could confirm that the proposed representation using a graph is an adequate tool for visualizing the relationship among residents.

A community is a system. In other words, a community is a typical example of a complex adaptive system, and it can be simulated using a suitable model such as a multi-agent systems approach. This implies that it is possible to develop a community as a complex adaptive system using appropriate design and analysis. In this study, we investigated the methods to analyze a community. We visualized the relationships on a daily basis among participants in the experiment using the passing-each-other data collected from them. As a result, we confirmed that each participant formed clusters that varied day-wise. We could also confirm several features that helped establish that a community is a complex adaptive system. Furthermore, the results for a weekday was significantly different to that of a holiday.

In addition, we investigated a method to visualize relationality assets more effectively. For that purpose, we introduced a new core concept of “media spots,” not only as places where residents could communicate with each another more frequently than in other areas, but also as a prospective platform to mediate relationality between humans, “Mono” and “Koto.” That is, “media spots” should have the potential to proactively promote resident-motivated communications and activities in a community. We have proposed a visualization method for “media spots” estimation from residents’ location information that uses density-based spatial clustering of applications with noise (DBSCAN) for cleaning enormous amount of raw location information data. The present results suggest that representative points extracted using DBSCAN can be used to visualize activities in a community more effectively and estimate media spots more accurately than the previously used method.

Prior research mainly focused on collecting and analyzing data sent unconsciously by the residents themselves, including location information and passing-each-other data.

However, in the process of analysis, we initially observed that a behavioral change of sharing the information voluntarily promotes a resident-centered community vitalization, rather than solving individual residents' community challenges by analyzing data. Shared information is also the source of relationality assets because it makes relationships strong. Therefore, we discussed a platform for promoting the transition of behavior of residents towards resident-centered community vitalization by sharing and visualizing the information that they voluntarily send. We confirmed that residents shared data regarding dangerous places voluntarily.

Finally, we described the development of future studies on vitalization of resident-centered communities by design of relationality.