International journal of police and policing

A Study on Utilizing IoT for Preventing Approach Restraining Order Violation

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Abstract

The most general form of Domestic Violence committed among family members is, especially, the violence by a husband upon a wife. Domestic Violence physically, mentally and in the manner of property damages not also the wife, the victim, but also the husband and the rest of the whole family members, inducing further social issues. When Domestic Violence is continued, as a mean to prevent the Domestic Violence, an Approach Restraining Order can be used. However, due to the particularity that the assailant and the victim are the family members, infringement of such Restraining Orders often occurs.

IoT entails mutual interaction of all information by linking all entities at any place and any time between a human and the other, a human and an object or an object and the other. A GPS-attached bag is linked to domestic IoT, offering the real-time location of children having the bag to their parents and enables rapid responses of the police to violent crimes by an automatic report to the police via a voice recognition sensor installed in public places, when a sound of scream is detected.

This thesis proposes a system to automatically report to the police when a sound of scream of a victim is detected by a voice recognition sensor included in a smart-device, and prevent crime commitments of assailants who infringes on Approach Restraining Orders by using their locational information provided by IoT-based smart devices.

[Keywords] *Policing, Domestic Violence, Internet of Things, Approach Restraining Orders, Location-Based Services, Voice Recognition Sensor*

1. Introduction

The number of Domestic Violence have been constantly increasing despite the improving life quality and stronger interests in lives of people. Domestic Violence means the violence occurring among family members, in fact, most of the assailants and victims are comprised of marital relations, especially wives being assaulted by husbands in most of the cases. Hence, Domestic Violence can be substituted by a term of Wife-abuse[1]. Domestic Violence causes physical and mental pain and property damages to not also the direct victim, the wives, but also the husbands, the assailants and their rest of the family members, further, resulting in comprehensive social issues[2].

The societies had recognized Domestic Violence as private issues for ages, however, since the mid-1990s, perception of people changed Domestic Violence into a crime, hence, to prevent such a crime, a Special Law for Domestic Violence has been legislated in a form of social responses[1].

When Domestic Violence occurs, the victim asks help to the police at first. If there is a concern of having the Domestic Violence be recurred, an Approach Restraining Order can be requested, in accordance with the Special

Law in relation to Domestic Violence, to eliminate the risk of recurrence. An Approach Restraint is a request by a victim to the court so that the assailant cannot approach to the victim. However, due to the particularity that the assailant and the victim are the family members, infringement of such Restraining Orders often occurs.

Thus, the thesis proposes a system to inform urgent emergency situations that may occur to a victim to the police and prevent any crime commitments by assailants who infringe on Approach Restraining Orders. The system being proposed includes a voice recognition sensor installed in a IoT-based smart device and provides location-based services.

The thesis composition as follows. Chapter 2 illustrates related studies to the system being proposed, Chapter 3 suggests a system that can prevent illegal behaviors by assailants against Approach Restraining Orders, by a mean of IoT-based smart devices. Chapter 4 examines the proposed system, and at last, Chapter 5 concludes the thesis.

2. Theoretical Background

2.1. IoT

Thanks to the development of wireless and wired networks and smart devices, overall interests in IoT, Internet of Things, that can link between any entities such as people and objects, at any time and any place, has been increasing. IoT is a technology that can actualize a true ubiquitous environment by adding a notion of 'thing' to the existing information technology concept that data can be transmitted at any 'time' and 'place' as depicted in <Figure 1>, and enabling dynamic connections between objects[3].

IoT is used in various areas ranging from home appliances, logistics, distribution and health care. Especially, the location-based services of IoT can be utilized for provision of various information in livelihoods such as traffic report and location tracing. The location-based services not only figure out locations of people and vehicles, but also can be

aided by being linked with emergency institutions when placed in a jeopardy[4].

Figure 1. Concept of the IoT.
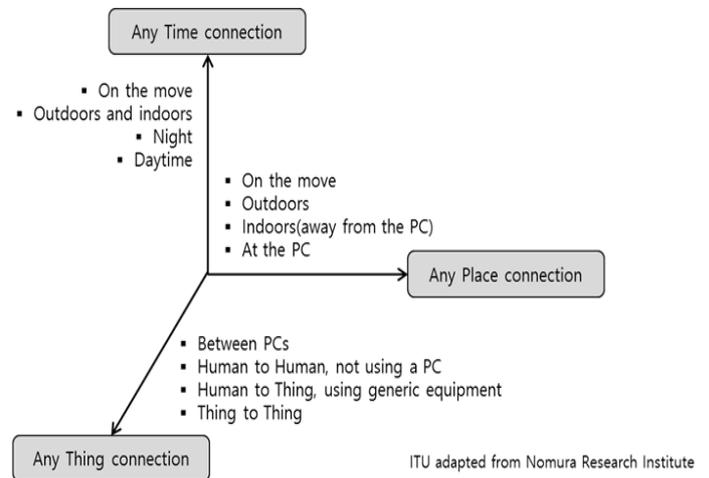
2.2. Domestic violence and approach restraining injunction order

According to the Special Law for Domestic Violence, Domestic Violence refers to "Commitment of behaviors occurring among family members and entailing physical and mental damages as well as property damage", and family members includes spouses in common-law marriage, a person who was a spouse, a person who is or was in lineal ascendant and descendant relationship including foster and parent children, a person who is or was in relationship of child of step-parents or a father's legal wife and a child of a concubine, and relatives living together[1].

From January to December of 2016, the number of counseling for Domestic Violence among all counseling via Telephone Domestic and Sexual Violence Relief Center by Korean women consists of 26.7 percent as 562 out of 2924. In most cases, the victim and the assailant were in a marriage relation, and such cases were 79.6 percent of all Domestic Violence counseling, and most of them involved husbands as the assailants against wives[5].

When Domestic Violence occur, the official organization that the victims call for help in their urgent situations is the police. Despite the first-aid practiced by the police, still there

is sufficient possibility of reoccurrence, hence an Approach Restraint should be used if the situation of the victim is fully approvable for protection from the assailant. An Approach Restraint refers to a request by a victim to the court, especially, when consistent violence is experienced by the victim from the assailant and if such a circumstance is likely to be repeated, so that the assailant can no longer approach to the victim[6].

Contents of the Approach Restraint is regulated in accordance with Article 29, Section 1 of the Law of Domestic Violence, and as the below table.

Table 1. Article 29, section 1 of the law of domestic violence.

No. 1	Isolation or vacation from the room where the victim or the family members live in or occupy.
No. 2	Restrained within 100 meters away from places such as house and work place of the victim or the family members.
No. 3	Prohibition of any contact via telecommunication based on the framework act on telecommunication article 2 no.1 to the victim or the family members.
No. 4	Consignment to a nursing home or other medical institutions.
No. 5	Custody to the jail or the detention center of national police offices.

Among the Article 29, Section 1 of the Law of Domestic Violence, Approach Restraining Orders from No.1 to No.3 cannot exceed 2 months, and only if extension of the measure is considered necessary to protect the victim and is approved, the measures can be additionally practiced 2 times for 2 months at each time[7].

2.3. Crime prevention by using IoT

As a 10 years-old girl was recently murdered in Incheon, the public interests in the safety of children has been increasing. Each telecommunication agencies are providing location-based services of IoT[4]. By linking household IoT with a bag which GPS is attached, parents can identify the location of their children with their bag through smart phones. Furthermore, the safe school commuting service is a service that informs parents through messages to their exclusive device units when their children passes either the front or the back gate, and allows identification of moving routes of children every hour as well as real-time location identification[8].

Crimes against women during the past few years have occurred in crowded public places. Therefore, an installment of security systems such as an emergency bell that allows rapid call for help at a crime occurrence in public places. However, despite an existence of an emergency bell, the system has a limitation to rescue victims as the system would work only if the force of an assailant is defeated. Moreover, observing attempted crimes, rescuing the victims were available thanks to the screaming of female victims in most cases. For that reason, KT has recently developed Safemate that adopted high-tech intelligent IoT technology. Safemate detects a sound of scream and report the emergency to the police, hence enables the victim to be rescued[9].

3. Proposed System

An Approach Restraining Injunction Order based on the Law of Domestic Violence is measure to suspend the assailant from 100 meters away from the victim and to prohibit all telecommunication including telephone and messages, depending on the will of the victim. However, due to the particularity that the assailant and the victim are the family members, infringement of such Restraining Orders often occurs, and damages from violence to the victim frequently results from the infringement[10][11].

Hence, the thesis would propose a system to prevent any crime commitments by assailants who infringes on the Approach Restraining Orders by using smart devices and to protect victims in emergency situations that is likely to happen to them via automatic reports to the police.

When an Approach Restraining Injunction Order is practiced, both the victim and the assailant should mandatorily attach an IoT-based smart device that transmits real-time locational information of themselves to the database ran by the police. Additionally, a voice recognition sensor is added to the smart device of the victim.

The system being proposed is operated by steps, in accordance with the distance between smart devices of the victim and the assailant.

Step 1: If the distance between smart devices of the victim and the assailant becomes within a kilometer, a warning sound is alarmed in each device, informing that the two devices are getting closer.

Step 2: If the distance between smart devices of the victim and the assailant becomes within 500 meters, even after the first warnings, the police send a text message to the smart device of the assailant that there is a possibility of infringement of the Approach Restraining Order. An exact locational information is provided to the smart device of the victim via a text message.

Step 3: If the distance between smart devices of the victim and the assailant becomes within 300 meters, even after the text message warnings, the police immediately call the victim, confirm the current situation and notify the safest place around the location of the victim. Furthermore, the police call the assailant, confirm the current situation and take warning measures.

Step 4: If the distance between smart devices of the victim and the assailant becomes within 200 meters, even after the direct warning calls, the police immediately move to the location of the victim and protect the victim, then record the current situation into the database.

Within the proposed system, the locational information of smart devices of assailants and victims which will be generated during operations, will be stored in the database which the police manage so that it can be utilized in civil and criminal lawsuits in the future. Furthermore, the smart device of a victim will automatically report to the police when it detects a screaming sound of the victim. The police who received the reporting alarm will immediately move to the victim and protect the victim from any probable emergency situations.

4. Contemplation of the Proposed System

The thesis proposed a system using smart devices to prevent crime commitments by assailants who infringes on an Approach Restraining Orders and to practice an automatic report to the police when the device detects a screaming sound of the victim.

Such proposed system is devised to entail the responses of the police by step based on the distance between two smart devices. That is, by informing assailants that the police is monitoring all current situations before any crime is committed, any illegal behaviors can be prevented in advance.

During the steps of responses by the police, the warning alarm at Step 1 can prevent any possible but unintended illegal behaviors as an assailant was not aware of the location of the victim.

Locational information of smart devices is stored in the police database in real-time, hence, can be used in civil and criminal lawsuits occurring in the future.

Finally, the smart device of victims with a voice recognition sensor detects a screaming sound and executes an automatic report to the police. The police who received the report immediately move to the victim and perform protection of the victim from any probable emergency situations.

5. Conclusion

Even with increasing social attention to Domestic Violence nowadays, the trend of Domestic Violence has been consistently increasing. Although Domestic Violence was not approved as a crime due to the perception of people upon Domestic Violence, as a

private issue, as the Special Law for Domestic Violence was enacted since the mid-1990s, a proper reason for the police to intervene into Domestic Violence has been arranged. If there is sufficient risk of recurrence of Domestic Violence and a need for protection of the victim is reasonably approved, the victim from Domestic Violence can apply for an Approach Restraining Injunction Order. However, although such application of Approach Restraining Order is accepted, in case of Domestic Violence, due to its particularity that the assailant and the victim are the family members, infringement of such Restraining Orders often occurs.

Therefore, the thesis proposed a system for preventing any crime commitments by assailants who violate the Approach Restraining Orders by using the locational information of both the victim and the assailants, received from their smart devices and to detect a screaming sound for a further automatic report to the police.

During the operations by step based on the distance of the two smart devices, the warning sound at Step 1 informs an assailant that the police is monitoring, hence, can prevent a crime commitment. Any possible but unintended crime as an assailant was not aware of the location of the victim, has become preventable by practicing a warning alarm at Step 1. In addition, through real-time storage of locational information of smart devices into the database operated by the police, civil and criminal lawsuits are enabled to utilize the information. Lastly, the smart devices of victims with a voice recognition sensor added, are devised to automatically report to the police when a screaming sound of the victim is detected and enabled an immediate move of the police who received the report as well as protection of the victim.

The system proposed in this thesis utilizes locational information that is received in real-time from smart devices. The locational information is an extremely sensitive data which may induce violation of privacy of an individual as it provides all data of active range and other contents of the person. Discussions for an appropriate utilization of the locational information are essential.

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