A Comparative Study on AI-based Anti-terror Crime System

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Abstract Background/Objectives: Recent terrorisms are not restrained in time and place, but have occurred simultaneously and throughout the world in various ways against random people. Therefore, the research suggests AI-based Anti-terror System module to predict terrorisms in advance, in a response to recognition of severity of the current terrorism state.

Methods/Statistical analysis:AI-based Anti-terror System module consists of 6 components - Data Collection and Filtering Module, 1st Analysis of Data and Rule Generation Module, D/B, Monitoring Device, 2nd Analysis of Data and Rule Generation Module and Crime Response Module - more accurate and rapid terror responses is enabled through systematic process of collection, analysis, monitoring, response and feedback on terror-related risk data from each of the modules and devices.

Findings: The proposal module collect relevant data to terror suspects with Big Data, analyze the realistically high terror-risk data, but filtered and stored, in two different phases, and generate and modify each rule based on extracted pattern of the analyzed data. Then, consistent monitoring on risky data of probable terrors is performed in concerns of the saved analysis and Crime Response Modules are triggered on the basis of the consequent results.Such a proposal module can improve the accuracy of related date, but save duration time in collection of particular data as it only collects relevant data to terror risks via Big Data Source and Filtering Module compared to the existing module. Furthermore, the operation manuals of 1st/2nd phase Data Analysis Modules systematically analyze the terror risks and probabilities, thus can minimize the risk of actual terrorisms in fields by triggering Terror Crime Response Modules rapidly by phases with an increased terror prediction accuracy. As Monitoring Device is additionally incorporated, constant supervision and feedbacks regarding certain risk data relevant to terrors are enabled - as a result, detailed analysis of high risk data is available.

Improvements/Applications: Owing to connections among recent terror groups, terror risks are omnipresent throughout the world and prior data collection for time and patterns of terrors has become difficult, hence the AI-based Anti-terror System Module would allow minimization of consequent terror damages, enabling preliminary terror prevention and rapid crime responses.

Keywords: AI, Terror, Data Collection and Filtering Module, 1st/2nd Analysis of Data and Rule generation Module, Monitoring Device

I. INTRODUCTION

The recent terrors are committed against indiscriminately random targets irrelevant to the terrors unlike the past cases against particular objects designated by terrorism groups. Furthermore, in the manners of recent terrorism patterns, the commitments are by not only direct members of terrorist groups, but also the general public with social discontents, thereby advanced prediction and prevention against terror crimes and terrorists have become extremely difficult.Even if no terrorist crime has occurred domestically in Korea, however an absolute exclusion of domestic terror risk is not presumable considering Kim(18) engaged in IS Terror group in 2015, North Korea appointed as a rogue state, and consistent uncovering of terror projects and commitments by followers of IS Terror groups in Phillipines, Malaysia and Singapore, et al [1].

Consequently, the research, considering the difficulties in prior predictions of international terrorism and targets due to no specific patterns monitored, offers AI-based Anti-terror System to minimize any possible terror damages and to even prevent their occurrences.

II. RELEVANT RESEARCH

2.1. Discussion on AI and Terrors

Examining the notions of AI and Terrors, Haugeland(1985) defines AI as the exciting new effort to make computers think. Machines with mind, in the full literal sense [2]. and Rich & Kinight(1991) as the study of how to make computers do things at which, at the moment, people are better [3]. Terror is differently defined by scholars, and Hoffman(2006) refers to the political, but violent, commitment by groups against nations or non-governments [4]. In addition, Merari(1993) defines Terror as the commitments with violence against target groups intending further spreads of fear [5].

As shown in[Figure 1]the international terrorism state, terrors increased till 2013, has decreased in number in 2014(3,736) and in 2015(2,225). Although the numbers in 2014 and 2015 decreased, their impact and influences were stronger. Moreover, even if the major terrorisms have prevailed in the Middle East, recent terrors are being committed in not only in the Middle East, but also Europe and the Americas all over the world - thus, precautionary response system is more desperately demanded against terrors than ever.
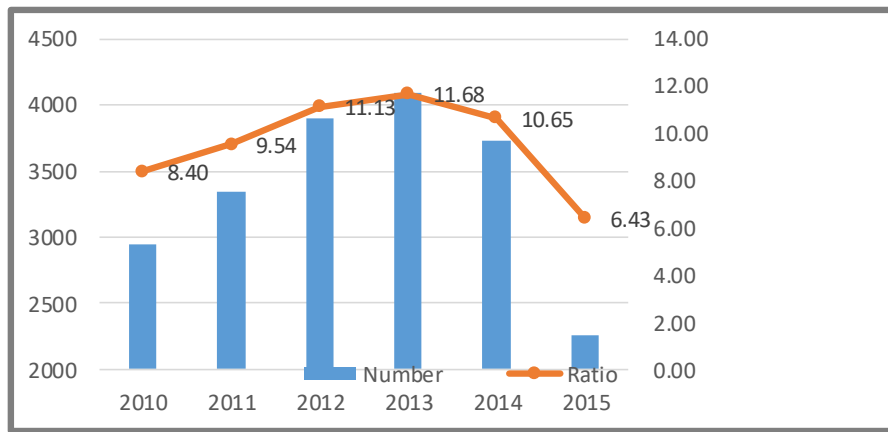
Figure 1. Annual Progress of Terror Event

Crimes and deviances including terrors requiring police operations is increasing, however the resource for the Police to mobilize or to utilize is too limited due to the national budget reduction policy [6]. Therefore, to more effectively operate the organizations and to overcome the issues, a system, for crime prevention, for the Police to predict, analyze and respond to the crimes is essential [7].

2.2.Criminal Investigation Cases with AI

Examining AI used in investigation of crime cases, AI is used for diverse areas such as theft, further crime inquiries and terrors, and the cases as following [Table 1] [8].

Table 1: Criminal Investigation Cases with AI

AI-used Cases	Contents
Recorded Future	Collect and analyze data via the Internet and perform Advanced prediction of potential terrors and criminal behaviors for crime responses
Series Finder	Analyze patterns of thefts and prevent them, thus, lowering particular crime commitment is available
AI Investigator	Further Crime Inquiry Module[9], which searching is available via AI algorithm for location, time and patterns of crimes.
Alsight	Analyze CCTV real-time video, Monitor all behaviors of all objects within the screen and Generate warning if any abnormal behavior is detected based on accrued object information - Image Analysis Technology [10].
Machine Vision Algorithm	Criminal Face-shape Learning System - a machine learning algorithm analyzing real criminal face traits and identifying possibility of crime occurences

In particular, a firm, Recorded Future, collects and analyzes terror-related data via the Internet, and allows prediction and preparation against actions by potential terrorist groups. In fact, Recorded Future enabled an anti-terror defense with absolutely no damage by an alliance against terrors by IS Terrorist Group by predicting the terror in advance.

Alsight is developed with an explosives terror in 2013 Boston Marathon as a momentum. It is a CCTV Video Analysis Solution against public terrors, analyzing behavioral patterns of people within a Hotspot location and alarming any irregularity or abnormality. Furthermore, Machine Vision Algorithm developed in China learns and analyzes facial traits of criminals with the facial recognition technology, hence allows identification of a possibility of terrorist crimes via curvatures of lips, distance between eyes and angle of a mouth from the tip of a nose[11].

III. PROPOSED SYSTEM

3.1. System Structure

The AI-based system identifies criminal pre-signs of terrors by terrorists and ultimately aims at minimization of damages of human lives. The system consists of 6 parts - Data Collection and Filtering Module, 1st Analysis of Data and Rule Generation Module, D/B, 2nd Analysis of Data and Rule Generation Module, Monitoring Device and Crime Response Module - and their functions as follows.Simply to examine the system implementation, above all, data pertain to terror suspects is collected via Big Data, then the high-risk data of terrorism is filtered and saved.

Furthermore, the filtered and stored data undergoes the 1st Analysis, then the traits and the patterns of the analyzed data are extracted for 1st Rule generation. The 1st Analysis data result is stored in D/B and is put into a conduct of constant monitoring for identification of terrors. The 2nd data set obtained from the monitoring is analyzed and modify the existing 1st Rule based on the 2nd Analysis data. The 2nd Analysis data is stored in D/B and the Crime Response Module of judicial authorities is operated on the basis of the saved 2nd Analysis data.

(1) Data Collection and Filtering Module

Through Big Data Sources including Web, Blog, SNS, Law Enforcement Agency and relevant Administrative Agency, data of various terrors and terrorists is collected, any probable high risk is extracted from the data from Big Data Filtering, then the extractions are stored in

D/B, enabling easier prediction of terror signs. That is, various data of terror risks is collected on Big Data basis, high risks are filtered, stored and transmitted to 1st Analysis and Rule Generation Module for further 1st Analysis.

(2) 1st Analysis of Data and Rule generation Module

Received data from Data Collection and Filtering Module is used and categorized in traits and patterns of terrorists, 1st Analysis is performed, and then consequent Rule generation in accordance with the 1st Analysis is conducted.

(3) D/B

The 1st Analysis data of probable terrorists based on the data from Data Collection and Filtering Module and 2nd Analysis data from Monitoring Device are separately saved in 1st and 2nd D/B.

(4) Monitoring Device

Referring to the 1st Analysis data stored, constant monitoring on high terror risk data is executed by Monitoring Device, then the data collected from the device is sent to the 2nd Analysis and Rule Generation Module.

(5) 2nd Analysis of Data and Rule generation Module

Received data from Monitoring Device is secondarily analyzed, and the Rule generated at the 1st phase is modified by the 2nd Analysis results, then is saved in 2nd D/B. Such a Rule modification by the 2nd Analysis is to provide higher risk terror data than the 1st, and enables more effective crime response systems by phases, by offering more accurate information in regards to target ranges and offense strategies of terrorists.

(6) Crime Response Module

Based on the 2nd Analysis result, Crime Response Module becomes operatable, hence minimizes human and property damages from terror crimes through prior responses against terrors.
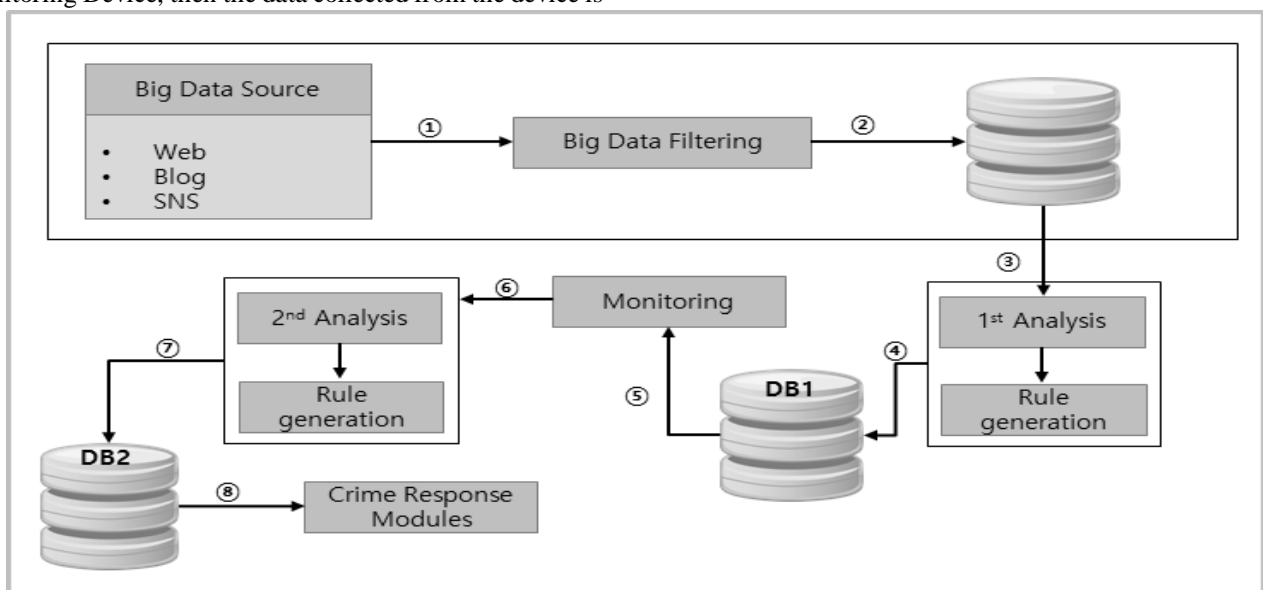

Figure 2. Design of AI-based Anti-terror System

3.2. System Implementation

The implementation of this system is as you seein [Figure 2].

1) Operation of Data Collection and Filtering Module

① Terror-related Data Collection via Big Data Source

② Filtering of Collected Data

③ Storing Filtered Data in DB

2) Transfer of the Filtered Data stored in DB to 1st Analysis Data and Rule Generation Module

① 1st Analysis of the Filtered Data stored in DB

② Rule Generation based on the data result from 1st Analysis

3) Transfer of 1st Analysis Data to DB and consequent Data storing

4) Transfer 1st Analysis data stored to Monitoring Device

5) Transfer of generated data from constant Monitoring on 1st Analysis data stored to 2nd Analysis and Rule Generation Module

6) Operation of 2nd Analysis and Rule Generation Module

① 2nd Analysis of Generated Data via Monitoring

② Rule Modification based on the 2nd Analysis data result

7) Transfer of 2nd Analysis data to 2nd DB and consequent Data storing

8) Operation of Crime Response Module based on the result of 2nd Analysis Data saved

① Offers of an Alarm and Warning Services on Terror risks against Judicial Authority

② Mobilization of Institutions similar to Judicial Authority

IV. EVALUATION

Table 2: Evaluation of the Proposal system

Category		Existing System	Proposed System
Data Collection	-Big Data Sources	0	0
	-Big Data Filtering	X	0
	-DB	**X**	**0**
Data Analysis	-Data Analysis by phases	X	0
	-Rule Generation and Correction via Data Analysis	X	0
Monitoring Device		X	0
D/B	-Data Collection and Analysis DB		
	-Data Collection and Filtering Module DB	0	0
	-DB of 1st/2nd Analysis Data	X	0
		X	0
Crime Response Operation Style	-Utilization of Data for Public Order Purposes		
	-Crime Responses by phases and Evaluation of post-Feedbacks	0	0
		X	0

As seen [Table 2], This chapter examines the effectiveness and the efficiency of each - existing AI Crime Response system[11] having been utilized by the National Police Agency and the suggested AI-based Anti-terror System - proposes a comparative revision of differences among functions and operations of the two.

First, in terms of data collection, the existing module does not accommodate Big Data and Filtering, hence the data range is too broad and requires excessive time for predicting particular terrors and terrorists, but even with low accuracy. However, the suggested AI-based module only collects and saves relevant data via Big Data Source and Filtering Module, hence lesser time, but higher accuracy can be achieved for collecting specific data.

Second, in terms of analysis operations, the existing module terminates analysis only at the 1st phase, while the analysis data is saved in DB in the suggested module, hence organize the 1st Analysis and Rule from the data Filtered, then this module even operates the data for 2nd Analysis as well as for Rule correction. Operational methods of the such 1st and 2nd Data Analysis Modules are more systematically and step-by-step conducted, therefore allows rapid responses against terrors with higher accuracy of prior prediction against the terrorisms.

Third, while the Monitoring Device is not installing in the existing module, as it is additionally installed in the suggested module, specific analysis for high terror risk data, and constant monitoring and feedbacks have become available.

Fourth, if the existing module merely and simply saved the collected data from Big Data, the proposed module saves the Filtered data, and re-saves it into 1st and 2nd Analysis categorizations. By saving such analyzed data with a categorization, future utility of the data in fields of public order and effectiveness of Crime Response Module operations have improved. In addition, real-time identification, detection and tracking of suspects are only operated as supportive tasks for investigative decision makings against terrors in the existing module, thus no practical Crime Response operation is being performed. On the other hand, the suggested module operates Crime Response Module in stages based on the 2nd Analysis data results and allowed rapid and phased crime responses against each terror risk.

V. CONCLUSION

Owing to the liaison among terrorist groups in the recent international communities, terror risks have become more serious and severe than ever, thus prior-preventive and responsive preparations against terrors should significantly be considered through recognitions that South Korea is no longer a safe country from terrors and terror crimes are the crimes causing the most severe human and property damages.

Therefore, the research, recognizing such a severity of terrors, proposed AI-based Anti-terror System Module by considering that the pragmatic precautionary functions and crime response patterns of the existing module is inadequate and enhancing the weaknesses.

The system is expected to minimize possible future damages from terrors by prior prediction of terrors, analyzing probable terror risks, and enabling rapid and accurate phased anti-terror responses as well as preemptive responses via Data Collection and Filtering Module, 1st/2nd Analysis of Data and Rule Generation Module, Monitoring Device and Crime Response Module.

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