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Identification of Significant Factors in Railway Accidents Dataset Using SOM Data Mining

Jibin Jimmy

Student, Dept of Dual Degree Computer Applications, Sree Narayana Guru Institute of Science and Technology

Kerala, India

Abstract - *Although a lot of labor and financial forces have been put into protection work, railway accidents proceed to be the foremost difficulty in India. The purpose of this find out about is to pick out the significant elements contributing to railway accidents and allow stakeholders to completely study from accidents. The Cognitive Reliability and Error Analysis Method - Railway Accidents (CREAM-RAs) taxonomy framework used to be proposed to classify human, technology, and organisation elements in railway accidents. To set up a Multi-attribute Railway Accidents Dataset (MARA-D), 392 railway accident reviews had been accumulated and collated underneath the CREAM-RAs framework. The records mining method (Self-Organizing Maps – SOM) used to be adopted to convert MARA-D into 2-dimensional maps. The key accident reasons had been dug out and threat statistics used to be transmitted to a number associated railway departments. Thus, the applicable measures had been raised to enhance security and promote fitness administration of railways.*

Key Words: **railway safety, significant factors, CREAMRAs, MARA-D, SOM, data mining**

1. INTRODUCTION

As a complicated socio-technical system, railway machine is concerned with elements about human, equipment, surroundings and management. Railway accidents proceed to take place though a lot of labor and financial forces have been put into security in India. Accident reviews are treasured assets for accident studying and prevention. A dataset can keep accident facts and promote higher hazard communication. Therefore, lookup on the institution and evaluation of railway accidents dataset would be a precious contribution to the accident prevention literature.

2. METHODOLOGY

2.1Construction process of MARA-D

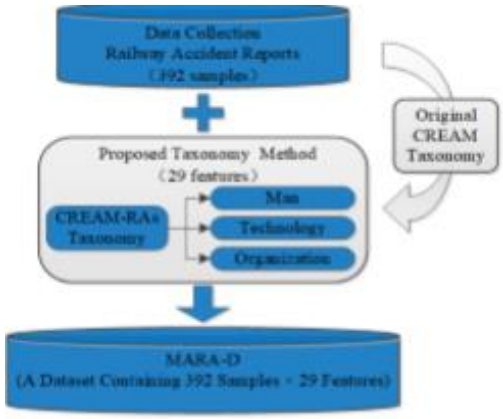


Fig. 1. The construction process of MARA-D.

A . Data Collection

We amassed 392 railway accident reports from the Indian authoritative public publications written by way of the Ministry of Railways Safety Supervision Division(MRSSD) thinking about that authorities departments supplied greater comprehensive and detailed accident analyses than other units. Each reporte laborates all the accident information in detail, such as accident brief, the accident result, the reasons analysis, the accident liabilities, the dealing with and the precautionary recommendations. The first-class of

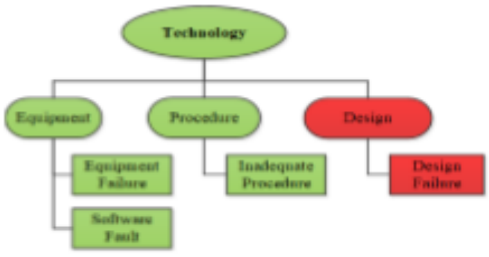
these reviews is dependable and they should be used for similarly decomposition.

B. Classification Method

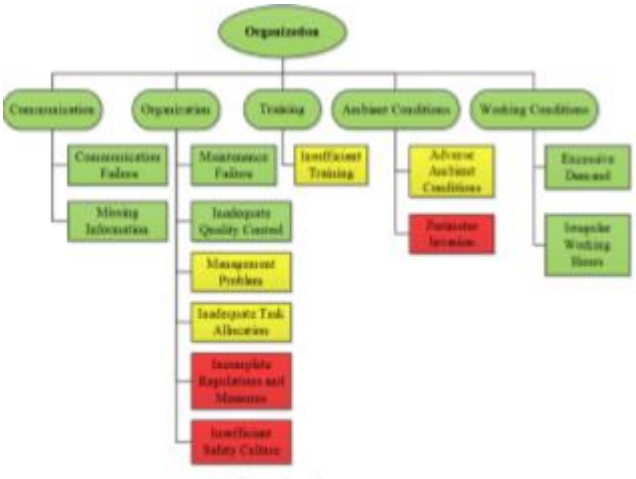
Based on the unique Cognitive Reliability and Error Analysis Method (CREAM) taxonomy developed via Hollnagel, the CREAM-Railway Accidents (CREAM-RAs) taxonomy used to be proposed in phrases of the railway machine in India to identify and classify human, science and corporation elements worried in accidents. The newly proposed CREAM-RAs taxonomy stored the three corporations of the authentic framework, whilst the specific contributing elements disbursed in every group were modified referring to the accident reports Fig. two supply an overview of the CREAM-RAs taxonomy. As we can see, the 29 contributing elements are divided into three categories: man, technology and organization. The green blocks represent contributing factors of the original model; yellow blocks represent contributing factors that we modified definitions but did not change the term names red blocks represent contributing factors we added. The elaboration for modified blocks of each category are given as follows

1) Man category: The movements of front-line operators are sorted into Execution Errors and Violations in accordance to Unsafe Acts of HFACS framwork. Insufficient Knowledge and Skills is introduced to describe employees' bad approach precipitated by using erroneous appreciation or reminiscence of education content. Cognitive Bias refers to personnel who lack of accountability and safety consciousness
2) Technology category: Design Failure is classified as Technology class in this learn about which refers to insufficient diagram in MMI, equipment, software, civil engineering and so on
3) Organization category: Incomplete Regulations and Measures encompasses these instances such as railway gadget lack of suitable technical standards, policies, documentations, directions and emergency plans. Insufficient Safety Culture refers to a team lack of security belief and security recognition. Adverse Ambient Conditions represents that the surrounding surroundings in which educate runs is poor, such as darkness, awful weather, earthquakes, landslides, etc

(a) Man category



(b) Technology category



(c) Organization category

3.SOM DATA MINING APPLIED TO THE MARA-D

3.1 SOM ALGORITHM

The intention of the data mining technique is to find out the sizeable elements and internal legal guidelines in railway accidents. To convert the multi-dimensional dataset into a 2-dimensional array enabling the data visualization and interpretation, a well known clustering method named Self-Organizing Maps (SOM), developed via Kohonen is utilized to the MARA-D.The SOM algorithm consists of four processes.

1) Initialization 2) Competition 3) Cooperation

4) Adaptation

3.2 SOMine Software Application

Viscovery SOMine is a software program suite for explorative data mining and predictive modeling primarily based on SOM algorithm and multivariate records in a workflow-guided mission surroundings In this work, we used Viscovery SOMine software program to realise SOM data mining science. In order to discover the internal legal guidelines of railway accident motives each typical and locally, we performed two clustering analysis. In the records mining manner through the use of one-of-a-kind enter spaces.

3. CONCLUSIONS

This work efficiently proposed the CREAM-RAs taxonomy relevant to railway accidents, and mounted an revolutionary accident dataset, MARA-D. Then an artificial neural community strategy – SOM facts mining evaluation used to be utilized to convert high-dimensional accidents information into two dimensional array enabling the information visualization and interpretation, which intuitively uncovered the key elements of railway accidents in India and similarly efficaciously transmitted the threat records to every department. The publicity of accident statistics has constantly been a massive hassle due to society stress in railway system. Since this approach does now not contain specific responsibilities, it helps the fast dissemination of accident statistics and enhances the probability of stakeholders remembering the accidents. In the future, new kind of accidents will take place and be got with the improvement of railway technological know-how and organizational capabilities, the CREAM-RAs taxonomy is no longer regular and it have to be modified for accuracy in accordance with the specific duration and condition. And MARA-D can be used to incorporate extra accidents data.

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