IJRETM
ISSN-2347 - 7539
International Journal of Research in Engineering Technology and Management

Solution of Governing Equations by AYM method

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ABSTRACT: We consider nonlinear differential equation in spherical coordinate that governs a convective mass transfer at a speed of *V*, provided that the diffusion coefficient *D*=(*f*(*C*)) that is a function of concentration, a second order chemical reaction takes place, $K_0 C^2$.

KEYWORDS: Deep Learning, Text Mining and Summarization, Collocation

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1. INTRODUCTIONS

The domain of applicability of Deep Learning and Machine Learning has cut across almost all spheres of live and our daily work activities. Such application ranges from predicting and classification using historic datasets etc. These models use machine and deep learning approaches to perform prediction and classification just as humans do. The domain of law is no exception. Usually, the process of prediction starts with one or more questions. Whether to settle the case outside the court or in the court? What are the chances of winning the case? (Olga Alejandra,2021).

This article presents a methodology for quantitative assessment of pilot situational awareness using polygonal modelling. The methodology takes into account visual, auditory, communication and tactile information, as well as the speed of reaction to changes in flight. This approach allows not only to assess the level of awareness, but also to identify weaknesses and improve pilot training.

2. LITERATURE REVIEW

Thus, if we transpose these benefits to the legal system, using AI tools could reduce the time and costs of justice administration. Accordingly, technology is already transforming the justice system. These are some of the questions that involve predicting the outcome of a case and the legal practitioners have to deal with, on a regular basis. These questions represent the importance of outcome of prediction in case selection, making settlement decisions, and various aspects of legal processes. Legal practitioners have been analyzing the cases retrospectively to identify and understand the elements or factors that play an important role in producing judgments. However, analyzing judgments after their declaration is not the only method to understand the decision-making process as noted in that the explanatory theories ought to be tested against future outcomes as well. Hence, predicting outcomes of judgments and then analyzing successful and unsuccessful predictions of outcomes may gain us important insights into the decision making of legal cases. (Rafe Athar et al (2019).

4. 4. Real-life scenarios and expert opinions:

Jones, D. G., & Endsley, M. R. (1996). Sources of situation awareness errors in aviation. Aviation, space, and environmental medicine, 67(6), 507-512. A study of the sources of situational awareness errors in aviation, which helps to identify critical factors that affect flight safety [58].

5. Use of simulators:

Salas, E., Prince, C., Baker, D. P., & Shrestha, L. (1995). Situation awareness in team performance: Implications for measurement and training. Human Factors, 37(1), 123-136. This study examines the use of simulations to measure and train situational awareness [58].

3. METHODS

To quantify the pilot's situational awareness, a special formula has been developed that takes into account the importance of different types of information (visual, auditory, communication and tactile) and the speed of reaction. The formula is as follows:

$$SA=V\times Wv\times Tv+A\times Wa\times Ta+C\times Wc\times Tc+S\times Ws\times Ts$$

where:

V - visual awareness.
A – audio awareness.
C – communication awareness.
S – sensory (tactile) sensitivity.

Tv, Ta, Tc, Ts – time factor for each type of awareness.
Wv, Wa, Wc, Ws – weights (coefficients) that determine the importance of each aspect.

The interpretation and implementation of the law are heavily dependent on legal texts. Hence, decision making in a legal case requires going through lots of legal documents. However, extracting relevant information from the legal text documents is a tedious and extremely time-consuming due to their special characteristics like longer document size, a wide range of internal structure, extensive manual indexing, a complex pattern of between documents and great reliance on citations. It makes the task of outcome prediction difficult. Various legal factors affect the outcome of a legal case and these factors may differ greatly from one case type to another. Considering all the factors is infeasible for any predictive model. Hence, the factors that seem most relevant and useful for the problem are usually taken into account

This paper developed text mining and summarization model that has the potentials of predicting court verdicts and sentencing in advance which will clearly inform the parties involved on the next action to follow. The model was developed with Long Short Time Memory Network and N-gram model for the handling the collocation problem.

The weights can be determined through consultation with aviation experts, as well as analysis of real-life scenarios and research.

Trying to find a balance between the different aspects and their importance is the goal of achieving an optimal level of situational awareness.
Additional parameters can be added to the formula to account for individual pilot reactions and characteristics. For example, an individual effectiveness factor (IE) can be introduced to reflect the characteristics of each pilot. The modified formula looks like this:

$$SA = V \times Wv \times Tv \times \mathrm{IE}v + A \times Wa \times Ta \times \mathrm{IE}a + C \times Wc \times Tc \times \mathrm{IE}c + S \times Ws \times Ts \times \mathrm{IE}s$$

where:
IEv,IEa,IEc,IEs – individual efficiency factors for visual, audio, communication and tactile awareness, accordingly.

4. RESULTS

To determine the optimal weights of each aspect, a series of experiments were conducted with the participation of experienced pilots in simulated flights. The results of the experiments allowed us to determine the following weighting factors for standard daytime meteorological conditions (Table 1).

The flight phase	Visual	Audio	Communication	Tactile	Time factor
Take-off	40%	20%	15%	15%	10%
Cruise	25%	20%	30%	15%	10%
Landing	35%	30%	20%	10%	5%

5. DISCUSSION

The results show that the importance of different aspects of situational awareness varies depending on the phase of the flight. For example, visual awareness is most important during take-off and landing, while communication awareness becomes critical during cruising. The weights were determined based on consultations with aviation experts and analysis of real-life scenarios.

The proposed methodology allows to quantify the level of pilot situational awareness and identify weaknesses in crew training. The use of this methodology can improve pilot training and increase the efficiency of decision-making in emergency situations.

6. CONCLUSIONS

The methodology for quantifying pilot situational awareness using polygonal modelling demonstrates its effectiveness in determining the level of awareness at different phases of flight. Further research can be aimed at adapting the methodology for different types of aircraft and flight conditions, as well as at developing individual performance coefficients for pilots.
To use the formula with these parameters, it is necessary to obtain data from real or simulated aviation scenarios:

- Flight data (Flight Data Recorder, Voice Recorder)

- Real flight simulators - can provide the ability to create and simulate various flight scenarios to obtain relevant data.
- Expert opinions and research.
- Experiments and scenarios.

The formula for calculating situational awareness (SA) can be useful in aviation safety because it allows for a quantitative determination of the pilot's or crew's level of awareness of various aspects of flight. The application of this formula can have the following benefits:

- Assessment of the level of awareness: allows to take into account the importance of different aspects of awareness, such as visual, auditory, communication awareness, etc.
- Weighting the importance of aspects: The weights (W_v, W_a, W_c, W_s) can reflect the importance of each aspect in specific scenarios.
- Identification of weaknesses: Analysing the results of the formula can help identify weaknesses in crew awareness.
- Improving skills and training: The application of the formula can be used to train pilots.
- Effectiveness of decisions in emergency situations: The inclusion of the time factor in all aspects of the formula is an important element in emergency situations.
- Application in aviation safety: The formula is designed to be applied in an aviation context, making it specific to determining pilot and crew awareness in different scenarios and phases of flight.

Pilot situational awareness at various phases of flight is one of the most important aspects of aviation safety. The use of polygonal modelling and the developed methodology contribute to the improvement of aviation tasks and the pilots' ability to react to various situations, and thus to flight safety.

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