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A Heuristic Algorithm Framework for Curbing the Spreading of the Covid-19 Pandemic

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Abstract
The article suggests heuristic framework for monitoring people's body temperature and physical distancing in public places. The imminent disruptive volatile, uncertain, complex and ambiguous (DVUCA) conditions require global leaders to prepare for the effects of the challenges that they will be facing. The continuous spreading of the Covid-19 pandemic throughout the whole world is a challenge that occupied most business leaders. Monitoring the physical distance and body temperature are some of the critical measures that have been recommended by the World Health Organization so as to reduce the spreading of the Covid-19. The proposed heuristic framework through constant monitoring of the two measures will reduce the spreading of the Covid-19.

Introduction

Heuristics are powerful algorithms that can be used to solve all problems that people are facing in the current disruptive world. The research proposed a heuristic framework for hybridisation of metaheuristics (hybrid heuristics). The volatility, uncertainty, complexity and ambiguity (VUCA) world (Adani, 2021) is upon us with the full package of intolerable challenges. Therefore, the heuristics should be applied in order to buy time for medical scientists to fully test and implement their developments. The appropriate strategies to reduce the spreading of the coronavirus disease 2019 (Covid-19) should be implemented to support the coronavirus vaccination strategy. The vaccines are part of the response strategies but people must continue to rely on public health measures (Mander & Stott, 2021). The Gulf Today described the coronavirus as far from over (GT, 2021). The erratic problems that the world is currently experiencing are the symptoms of the imminent real disruptive VUCA (DVUCA) conditions.

The Covid-19 is believed to have emerged in Wuhan City of Hubei Province of China in the late 2019 and rapidly spread throughout the whole world. All over the world, the Covid-19 infection rates are worrisome. As at 3 April 2021, 129 902 402 infections and 2 831 815 deaths were recorded from 223 countries worldwide (WHO, 2021). According to Singhal (2020), the Covid-19 fatality rate is estimated to range from 2 to 3%. Despite the surging in infection at 491 886 daily new cases, the implementation of the coronavirus vaccination is progressing well with 677.8 million people vaccinated at a daily rate of 15.8 million (Guardian, 2021) of the Woldometer's (2021) global population of approximately 7 856 742 536 people. The Covid-19 has so far killed more than 2.8 million people worldwide (GT, 2021). The relative percentage changes by country of the confirmed coronavirus cases are

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frightening as presented by Ritchie, *et al*., (2021). What is disappointing is the surging in infections and emerging of the new Covid-19 variants in many countries. The world is experiencing an increasing number of coronavirus infection (Lancet, 2020). According to WHO (2021), people can protect themselves and others by wearing masks, maintaining well ventilated rooms, observing physical distancing, avoiding crowded places, cleaning hands and coughing into a bent elbow or tissue. Thus, there is need to continue observing the physical distancing and monitoring body temperature as the fight against the coronavirus is not yet over.

This research suggests a physical distancing and body temperature monitoring heuristic framework for reducing the spreading of the Covid-19. Heuristics, especially metaheuristics, can be used to develop physical distancing and body temperature monitoring algorithms that can run on mobile sim cards, wristwatches and special necklaces in order to reduce the spreading of the coronavirus. The national registration and telecommunication records could be used to monitor the movement of people during Covid-19 lockdown and in crowded places.

Literature Review

According to Murairwa (2020), the only way to introduce powerful problem solving strategies is the hybridisation of hybrid heuristics (metaheuristics). The Covid-19 is a new public health crisis (Singhal, 2020) that is threatening to wipe out the world population. The World Health Organization (WHO) prescribed simple precautions for monitoring and reducing the spreading of the Covid-19 (WHO, 2021; CDC, 2021). So far, maintaining a physical distance of at least one metre, sanitizing hands and checking of body temperature are mandatory at all Covid-19 monitoring points. This is supported by Islam, *et al.*'s (2020) findings that practising physical distancing reduced the spread of Covid-19 by 13%. The lockdowns implemented by countries reduced drastically the spread of Covid-19. However, Chile's lauded roll out of Covid-19 vaccine failed to reduce the surge in infection rates (Mander & Stott, 2021). The health experts stated that relying on one strategy to combat the pandemic would be a conceptual error and thus, the vaccination is another response strategy to Covid-19 (Mander & Stott, 2021). As at 22 December 2020, Zimbabwe was experiencing a steady increase in the Covid-19 infection rate (Herald Reporter, 2020).

Heuristic Algorithm (HeAl) Framework

Instead of developing a wristwatch algorithm or a special neckless algorithm, the mobile sim card algorithm (MSCA) could be developed to monitor body temperature and physical distancing of the people in public and gathering places during the Covid-19 period. The heuristic framework has three parts, namely, the input, processing and output. The processing has three Covid-19 monitoring functions and these are:

- Physical Distance Monitoring (PDM): The heuristic algorithm (HeAl) should be able to detect the distance between two or more mobile sim cards. The mobile owners should receive warning signals when they are too close to each other in such a way that they may be at risk of contracting or spreading the Covid-19. The heuristic should irritatingly beep or vibrate in order to warn the partners who would be getting within the prohibited physical distance range that is conducive for spreading the Covid-19.
- Body Temperature Monitoring (BTM): The heuristic algorithm should be able to constantly monitor the body temperature and warn the person when it is out of the desired level. This function could reduce the inconvenience that most people are experiencing at body temperature monitoring points around the globe.
- Committing Offense Monitoring (COM): The heuristic should be able to collect data on the number of frequency that people will be bridging the physical distancing regulations for a possible penalty.

The Heuristic framework could generally be cited as the physical distance, body temperature and committing offence monitoring (PDBTCOM) framework because of its three major monitoring functions as presented in Figure 1.
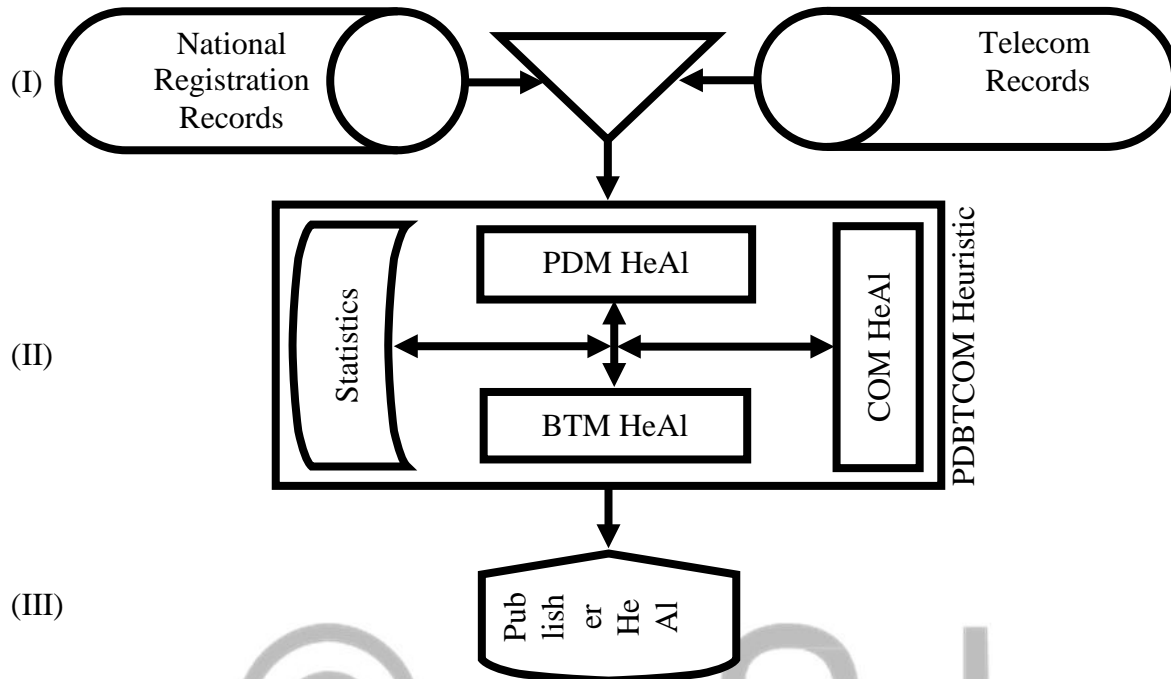

Figure 1: PDBTCOM Heuristic Framework

Figure 1 shows the input (I), processing (II) and output (III) of the PDBTCOM heuristic framework. The input (I) suggests that the telecommunication companies should access the centralised national registration records when registering clients on their different communication networks. A country must have a centralised database of records that can electronically be accessed by all sectors of the economy such as banking, insurance, security, agricultural, healthcare, hospitality, mining, education and production sectors just to mention a few. The processing (II) is made up of the physical distance monitoring (PDM), body temperature monitoring (BTM) and committing offence monitoring (COM) heuristic algorithms. The COM heuristic algorithm captures the results produced by the PDM and BTM heuristic algorithms for analysis. The outputs (III) of the PDM, BTM and COM heuristic algorithms are stored as internal output (statistics) or published as external output in electronic or hard copy by the Publisher HeAl.

The PDBTCOM heuristic framework could be used to monitor physical distancing between or among people in public and social gatherings. The PDBTCOM heuristic framework could also be implemented to track and identify criminal activities. The information that would be generated by the heuristic framework could be used as acceptable real time information for assisting in decision making at all Covid-19 check points. However, people often choose to ignore simple instructions that sometimes call for hard decisions to be made so as to save lives.

Conditions for implementation

A number of policies should be put in place in order to successfully implement the PDBTCOM framework. Some of the policies are henceforth discussed.

- Mobile infrastructure sharing: the telecommunication companies should continue share their infrastructures.
- Carrying mobile phone: the mobile phone users should always have their mobile phones with them all the time for easy monitoring with the heuristic framework.
- Changing mobile phone sim card: the mobile phone users should not be allowed to change their mobile sim cards until they get clearance from the regulatory authority.
- Temporary mobile sim card: all visitors should be given temporary mobile sim cards for using during the period of visit and should surrender them on their day of departure.
- Enforcing policies: the policies that enforce the adherence to the dictates of the Heuristic framework should be put in place.
- Updated national registration and telecommunication records: The two databases should be merged in order to create one database for the implementation of the PDBTCOM framework. At birth, a child should be allocated a national registration number that would be accessed by the telecommunication companies to allocate a mobile sim card upon request.
- Advocacy for adoption: Strategies should be put in place to educate the nation on the importance of the Heuristic framework.

Conclusion

The heuristic framework appears complex and a mammoth task to achieve but with the way technology and DVUCA conditions are changing, the world needs such developments. The infection statistics from lockdowns show a total reduction in Covid-19 infection rates. Therefore, the application of the framework would drastically reduce the Covid-19 infection rate to manageable levels. The use of the PDBTCOM heuristic framework is not compulsory as one may opt not to have any mobile sim card, wristwatch or special necklace. People should volunteer (Murairwa, 2015; 2014) to participate in the programme in order to save lives. The heuristic framework would provide information and data for managing the Covid-19 and any other similar epidemics. The DVUCA conditions are unchecked human behaviours and thus, humans should provide solutions to the challenges they deliberately create.

List of abbreviations

DVUCA: Disruptive Volatile, Uncertain, Complex and Ambiguous
Covid-19:   Coronavirus disease of 2019
VUCA: Volatility, Uncertainty, Complexity and Ambiguity
WHO: World Health Organisation
HeAl: Heuristic Algorithm
MSCA: Mobile Sim Card Algorithm
PDM: Physical Distance Monitoring
BTM: Body Temperature Monitoring
COM: Committing Offense Monitoring
PDBTCOM: Physical Distance, Body Temperature and Committing Offence Monitoring

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