CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter provides explanation on optimization algorithm and disaster relief management as a whole. It starts with the overview of disaster management, a list of existing disaster relief operation management in disaster event. This chapter also explains on the types of optimization and heuristic search with their ability and slackness. While, in order to develop new algorithm, the idea from existing case study related is also included in this chapter.

2.2 Disaster Management

The challenges of humanitarian organizations are the limited decision technologies to assist the disaster relief operation. In Malaysia, almost every year the country will facing flood issue (Gasim *et al.*, (2014). In flood disaster scene, the main task is to ensure that assistance and aid are provided to disaster victims in an orderly and effective manner from the national level downwards (Mai, T. *et al.*, 2020). Its approach is largely reactive to flood disasters (Chan, N.W., 2015). Thus, principles from the field of selection strategic distribution centre is helpful for volunteer to gather and distribute the basic need (Abualkhair, H. *et al.*, (2020); Chiang, H. H. *et al.*, (2020). Disaster management in Malaysia is traditionally almost entirely based on a government-centric top-down approach. Inefficiency and problem in managing basic need distribution affected victims and they do not receive any during flood tragedy. Disaster management can be done efficiently, and we can assist the disaster victim

to receive the help in all aspect timely (Abdullah, M. S., 2016).

Disaster Management can be defined as the discipline that tries to make out how to avoid and face risks (Haddow et al., 2007). A system of disaster management is a cycle that comprehends four stages included mitigation, preparation, response and recovery (Altay and Green III, 2006; Tomasini and Van Wassenhove, 2009; Nikbakhsh and Farahani, 2011). Mitigation consists of the application of measures that prevent the disaster from occurring or reduce its effects if it does occur. Preparation enables communities to organize and prepare for appropriate action in case of disaster. Logistical planning for aid operations, establishing communication plans, assignment of responsibilities, coordination of operations and aid staff training are all done at this stage. Response involves the use of resources and emergency procedures carried out according to the previous planning requiring the immediate participation of staff and delivery of all equipment to the disaster zone. Recovery refers to the activities covering long term effects, such as stabilizing and restoring the damaged area which will be the main focus in this research.

Natural and technological disasters still make noticeable the vulnerable condition although the massive improvement has been achieved in prospect of economic and social. Referring to the World Disaster Report in 2016, made by the International Federation of Red Cross and Red Crescent Societies, (IFRC) is the world's largest volunteer-based humanitarian network.

The number of disasters continues took place, as a result of a combination of increased vulnerability from more people living in dangerous places and climate change.

During 2015, a total of 574 reported disasters, caused by earthquakes, floods, landslides and heat waves, had killed almost 32,550 people, affected over 108 million people, and caused US$ 70.3 billion in damage. The 2010 floods in Pakistan directly affected around 20 million people, and have continued to displace substantial numbers each year. In regard to drought, during 2011 and 2012, more than 12 million people in the Horn of Africa were severely affected in what has been called the worst drought in 60 years. The Ebola outbreak in West Africa, beginning in March 2014, led to 11,310 deaths across Liberia, Sierra Leone and Guinea (WHO, 2016). The Haiti earthquake of 2010 striking one of the poorest countries in the western hemisphere. The population loss, of between 100,000 and 316,000. Other large-scale disasters involved Tohoku earthquake and tsunami in Japan 2011. On March 11, 2011, a magnitude-9 earthquake shook north-eastern Japan, unleashing a savage tsunami. The effects of the great earthquake were felt around the world, from Norway's to Antarctica's ice sheet. More than 18.000 people were killed in the disaster, most of whom died by drowning. The impact from tsunami caused a cooling system failure at the Fukushima Daiichi Nuclear Power Plant, which resulted in a level 7 nuclear meltdown and the release of radioactive materials. Two years after the quake, about 300,000 people who lost their homes were still living in temporary housing. The Philippines' 2013 Typhoon Haiyan as well as numerous smaller disasters triggered by natural phenomena reinforce the increasing threat of such events. Each disaster recorded number of people affected was up to 3 million. They lost everything, they lost homes, access to food and water.

The disaster happen in Malaysia is flood which is on January 2017. Almost all the states in Malaysia affected by the flood, with thousands of people having to be evacuated

to each relief centres. Many areas in Johor, Selangor, Perak, Malacca, Kelantan, Sabah, Sarawak, Pahang and Negeri Sembilan are flooded. It is a nightmare for Johor resident because the impact is huge as reliving the flood of 2006 and 2011. They lose millions in damage and brought communications to a standstill.

In Perak, about 400 people from four districts were relocated after their homes were hit by flash floods. Pantai Remis was badly hit when the flood water levels rose to two metres at Kampung Kilang, Kampung Pulau Meranti, Taman Anggerik Permai, Kampung Kasi, Jalan Sitiawan and Kampung Paya Ara. In Selangor, Malacca and Kelantan also having heavy rains for a few days. In Kota Baru, a total of 3,344 flood victims in Kelantan were sheltered at 24 evacuation centres in Kota Baru, Pasir Puteh, Pasir Mas and Kuala Krai. And another disaster happen floods which strikes our West Coast areas in 2014 covering a large areas in Kelantan, Terengganu, Pahang and Perak has trigger an immense national interest. To be concluded, flood is no longer surprise for Malaysian. Year by year, the netizen be more aware towards flood disaster preparation. Mass media play a big role to this campaign.

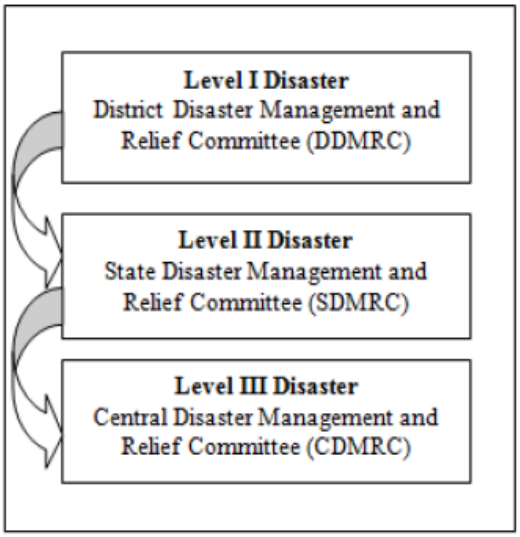
Disaster management in Malaysia is traditionally almost entirely based on a government-centric top-down approach. The National Security Council (NSC), under the Prime Minister's Office, is responsible for policies and the National Disaster Management and Relief Committee (NDMRC) is responsible for coordinating all relief operations before, during and after a disaster (Chan, 2012). The Instruction of NSC No.20 document stated that the mechanism of disaster management and the task should be done for government, non-government, volunteer organization, and disaster management team. The

table below shows the division of area which include the district, state, and central to divide the assignment (Khalid & Shafiai, 2015). This document had shown the needed in different expertise in facing disaster event.

The fact that Malaysia has been spared from the worst forms of natural disaster such as hurricane and tsunami contributed to a degree of complacency. However multiple catastrophic events have occured in the year of 2014 and early 2015 raised the alarm for the need of effective disaster activation and response system. In less than 16 months we had faced disastrous flood, plane and helicopter crashes, motor vehicle accidents and earth quake in Sabah (Yan & Chan, 2015). All these fatal events required efficient management of workforce. The disasters have traumatized the victims when they loss of transport, house, and money. The standard operating procedures, limitations that may occur during disaster include under developed synchronization or coordination between the disaster site and the responding authorities (Tsai& Chen, 2011). When all authorities play their role and use the skills to handle the situation, the disaster event should be managed professionally.

When disaster strikes, coordinating the schedules of government agencies, first responders, nongovernmental organizations (NGOs), military commands and volunteer organizations is a monumental challenge (Lawry, 2010). The people need to be assigned and deployed, as well as materials that need to accompany them food, water, tools and first aid supplies. Many improvement has been made but there is still the absence of an efficient disaster management system that will help the people in times of calamities (Yi et al., 2010).

Figure 1: Disaster Management Level/ Executive Committee



Source: Chan, 2012

Thus, the disasters clearly have had a serious impact on human security. Disaster management and volunteerism is having close relationship. The volunteers will be active in times of crisis, so it is vital that emergency services and other organizations are prepared to cooperate with them and coordinate their activities (Yi et al., 2010).

Therefore, the disaster defined as the event in this research and it is related to determine the optimal distribution centre

2.1.1 Flood

The most devastating natural disaster experienced in Malaysia is flood. A flood can be defined as any high water flow that dominates the natural or artificial banks in any part of the river system. Therefore, when a river bank is overtopped, the water extends over the flood plain and generally becomes hazard to the society (Ching et al., 2013). When floods

occurred, it has terrible impacts on people as it disrupts their day to day activities and the impacts can last for a week in the coming years, climate change is likely to make the situation even more challenging. Floods in Malaysia have been classified in two categories by the Malaysian Drainage and Irrigation Department, i.e. flash flood and monsoon floods (DID, 2000a). Based on the hydrological perspectives, the obvious dissimilarity between these two disasters is the period taken by the river flow back to the normal level. Monsoon flood can last for a month while flash floods take a few hours to return to the normal water level (Noorazuan, 2006).

Generally, all states in Malaysia are experiencing floods throughout 2016 to March 2017. The most flooded state is Selangor with a total of 115 flood events and is followed by Pahang state with 69 incidents and Perlis recorded at least two flood events Table 2 shows flood events throughout Malaysia by states for 2016/2017 (Department of Irrigation and Drainage Malaysia, 2018).

Table 1: Information on Flood Disaster in Malaysia 2016/2017

(Department of Irrigation and Drainage Malaysia, 2018)

Negeri	Bilangan Kejadian Banjir	Purata Hujan Harian Tertinggi (mm)	Tempoh Banjir Maksimum (Hari)	Jumlah Perpindahan Mangsa Banjir	Taksiran Kerugian (RM)	Kedalaman Banjir Maksimum (m)
Perlis	2	68	1	-	30,000.00	0.5
Kedah	41	185	1	890	4,124,800.00	1.5
Pulau Pinang	46	192	1	-	-	1.2
Perak	31	115.5	2	117	-	1.2
Kelantan	4	469	9	40,263	33,070,000.00	6
Terengganu	4	429	10	28,638	2,272,000.00	2.5
Pahang	69	429	4	10,432	13,143,000.00	3
Selangor	115	57.9	1	70	-	1.5
Melaka	8	156	2	71	-	0.6
Negeri Sembilan	14	215.6	1	404	577,500.00	1.5
Johor	8	255.5	16	11,715	-	2
Sabah	6	169	1	16	-	1.5
Sarawak	45	282	3	3,313	-	1.8
WP Kuala Lumpur	6	106.5	0.17	-	-	1.5
WP Labuan	5	36.5	1	-	-	0.5
Jumlah	**404**		**Jumlah**	**95,929**	**53,217,300**	

Source: Department of Irrigation and Drainage Malaysia, 2018

2.3 Disaster relief operation in Malaysia

During the flooding event late 2014 in various state in Malaysia such as Kelantan, Perak and Pahang, there were massive movement of volunteers from all over Malaysia to these state. However, the voluntary effort could be optimize by better coordination and synchronization that will maximize the use of resources such as time, food and medical supplies and people. Thus an optimization approach should be embedded to make the volunteer management during post disaster a step efficient in term of time and productivity. An effective and timely relief activities, the insecurity of individuals and communities are really need to improve the stability in the region (Osa, 2012). This is because, the assets and economic activity can be distorted due to disaster effect. Thus, the adequate outside help in the relief stage, disaster-torn societies are really need to recover fully and not let the

future disasters become vulnerable. Volunteering work is about provides services without financial gain. It is also renowned for skill development, and is often intended to promote goodness or to improve human quality of life. Generally, people tend to chaos and being disorganization when it comes to handle disaster event. The volunteer play the main role in helping affected victims to respond and recover. In most developed countries, disaster management and emergency relies mainly on workforce of professional and the volunteers affiliated with official agencies (Alexander, 2010).

The disaster event should be handled in team. For example, when flood disaster start to recover, people around the state or country has been concerned and they really excited to help on what service they can do. Thus the efficient task division and preparation for the tools and skill need to be properly plan to prevent any chaos effect and disorganization. It is necessary to maximize the effectiveness of emergency and disaster management by drawing on the immense knowledge, skills, resources, networks and enthusiasm of volunteer (Whittaker et al., 2015). Therefore, the volunteers in this research defined as the entity that play a big role in disaster relief and rescue process and the number of volunteer and skills will be used as variable for the proposed algorithm.

When disaster strikes, coordinating the schedules of government agencies, first responders, nongovernmental Organizations (NGOs), military commands and volunteer organizations such as NADMA is a massive challenge. And it is not just the people who need to be assigned and deployed, but materials that need to go together with them such as food, water, tools and first aid supplies. Existing system focuses on Emergency Planning

and Response solution which can manage real world crises from natural disasters and provides a comprehensive array of automated support tools for effective emergency response including multi organization scheduling, multimodal and universal communication, mass notification, alert dispatch, and presence control, as well as training management and up to the minute event data. It can be deployed immediately to any location in support of port authorities, military agencies, first responders, and disaster management. In real situation, the organizer is offering training according to the required skill sets. Training sessions are needed to polish and allocate the potential volunteer to the correct role. This is to ensure efficient mapping of skills to task assignments. The right people are matched to the right jobs so all requirements are met. The figure below shows generally on incident management relationship in term of collaboration of organization in making incident rescuers successful.

Table 2: Incident management relationship

Incident Management	Volunteer Organization
	Non-Governmental Organization (NGO)
	Military
	First Responder
	Goverment agencies

Source: Whittaker et al., 2015

2.3.1 Government Agencies Involved for Disaster Relief.

National Disaster Management Agency (NADMA):

With slogan "Manage disaster People Safe", NADMA is one agency to assure citizens safety and encourage the teamwork within organizations to improve the ability to be ready

in disaster management. This agency involves in national disaster management and planning machinery so that it can be managed more efficiently, effectively and to all levels of society, especially those affected by the disaster. Concerns of local communities, early warning and preliminary accountability of the responsible agencies will be especially helpful in the placement and safety of victims. NADMA also has a portal to be the platform to deliver the latest in-depth information on disaster (NADMA portal, 2018).

Figure 2: National Disaster Management Agency (Nadma)

Source: NADMA Website,2020

Social Welfare Malaysia (JKM):

JKM is the department involve in preventive and rehabilitative services in social issues as well as community development. As one of the government agencies, JKM plays an important role in social development, it has been placed under Ministry of Women, Family and Community Development.

Figure 3: Department of Social Welfare Malaysia (JKM)

Source: JKM Website,2020

National Security Council (NSC):

The National Security Council (NSC) is responsible for coordinating national security policies and instructions on security measures including security movements, public order and security matters directly across the country at federal, state and district levels. The NSC is also the body responsible for assisting the National Action Council (MTN) in matters relating to security (NSC website, 2018). Since its inception, a total of 21 NSC Instructions have been issued to address various current security threats such as the influx of Vietnamese refugees and illegal immigrants, bilateral security and border cooperation, smuggling, terrorism control, public order and crisis management and disaster. NSC is a leading agency that coordinates security-related policies since its inception in 1971. The power source for NSC is the NSC Directive No. 1 which is based on the Emergency (Essential Powers) Act 1979 which clarifies the formation and responsibility of the

National Security Council. Basically, the NSC is responsible for coordinating the relevant policies for national security and the direction of security. When disaster happen, NSC will be leading and giving instruction for further action. These structures and safety mechanisms are also applied at state, district and village levels.

Figure 4: National Security Council (NSC)

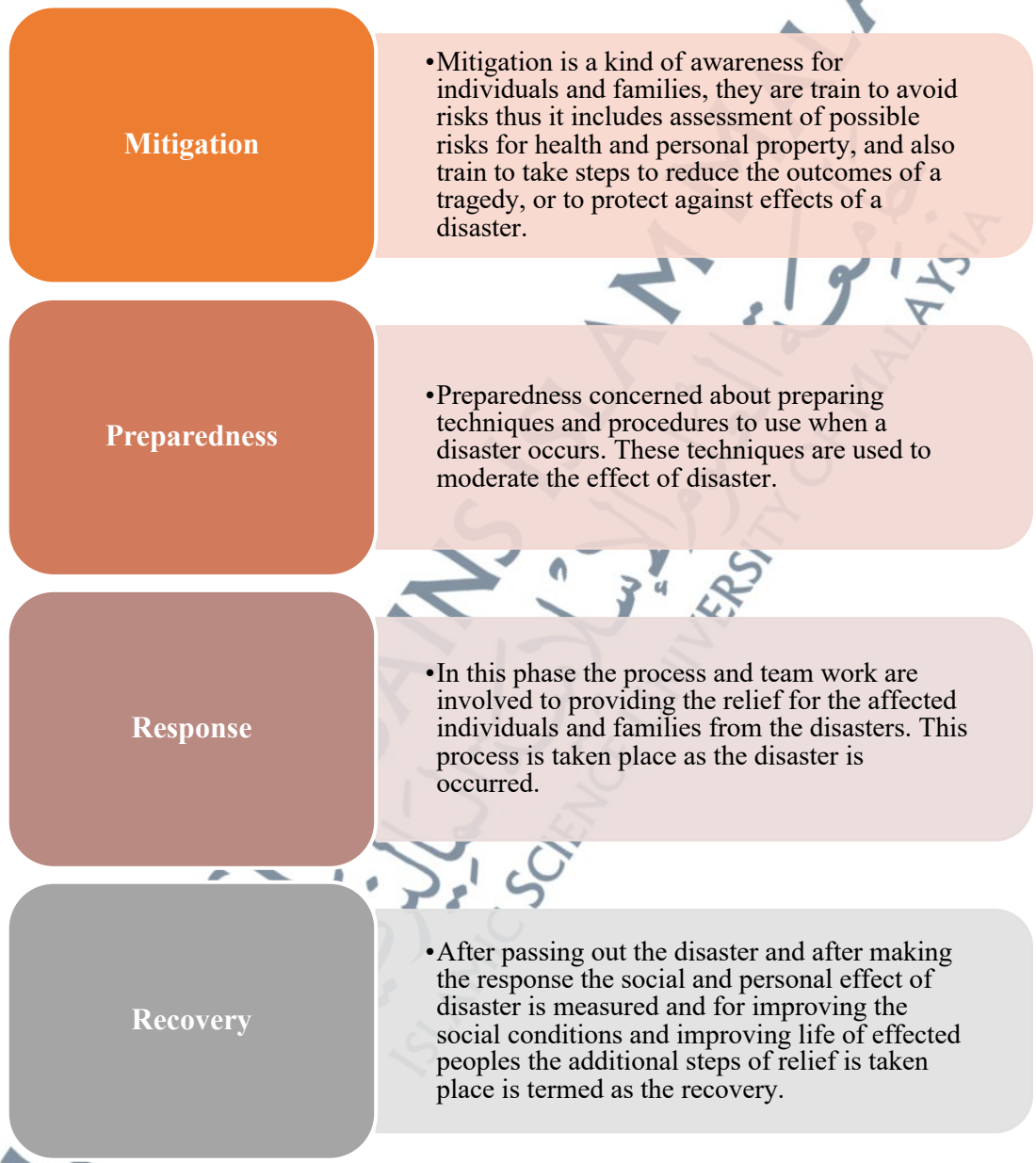
Source: MKN Website, 2020

2.4 Phases of disaster response

In order to deal with the issues and circumstances of the natural disasters the palling and management is primary requirement. Therefore, the disaster management techniques are developed to reduce the impact of disasters in the social and economic life cycles. Disaster is a kind of emergency where a large amount of human life and revenue is lost therefore in

order to manage or recover the loss from such event a management scheme is required to handle the conditions. According to the effect and management steps the entire management process can be described in four phase process (Baird, 2010) as per below.

Figure 5: Phases of disaster response



Source: Baird, 2010

2.5 Post-disaster

Post-disaster or disaster recovery is the process of returning an organization, society, or system to a state of normality after the occurrence of a disastrous event. Disaster recovery has three distinct but interrelated meanings (Michael, 2016). First, it is a goal that involves the restoration of normal community activities that were disrupted by disaster impacts. In most people's minds, exactly as they were before the disaster struck. Second, it is a phase in the emergency management cycle that begins with stabilization of the disaster conditions which stated in the end of the emergency response phase and ends when the community has returned to its normal routines. Third, it is a process by which the community achieves the goal of returning to normal routines. The recovery process involves both activities that were planned before disaster impact and those that were improvised after disaster impact. Post-disaster recovery planning is a shared responsibility between individuals, private businesses and industries, state and local governments, and the federal government (University of Oregon's Community Service Centre, 2007). Post-disaster recovery planning is defined as developing a set of strategies to assist a community in rebuilding after a disaster occurs. Recovery planning can also be thought of as building the blueprint for reconstruction of the community after a disaster. There are a number of activities that communities can engage in to address post-disaster recovery.

In Malaysia, we have NADMA, JKM, and volunteer to assist in disaster recovery activity (Sani et al. 2014). These strategies may include developing and implementing post-disaster recovery plans, business and government continuity plans, utility recovery and reconstruction plans, temporary shelter and housing plans, and most importantly the

establishment of a coordinating organization and guiding principle for reconstruction. In addition to post-disaster recovery planning, mitigation, or loss reduction activities such as relocating critical facilities out of harm's way which may help communities become more disaster resilient by removing the potential for damage before an event occurs.

Distribution centre for post disaster recovery activity is the place for the volunteer or agency to be gathered, the facility, aid, and needs. According to JKM, The relief centre is the Building or area declared by the District Disaster Management Committee (JPBD) and can be used to accommodate Disaster victims. This building / building has to be equipped with basic facilities such as space, clean water, electricity, self cleaning facility and always safe to use (Department of Social Welfare Malaysia, 2018). The centre will be conducted by the lead which a member of JKM and assisted by the committee.

2.6 Fitness Function

The quality of the fitness function defines how fine a program can resolve a certain problem. Importantly, there are two main classes of problems, those where the fitness function does not change and those where the fitness function changes during the search process. Heuristic search cascades into several broad categories, which include greedy construction methods, local neighborhood search, relaxation techniques, decomposition, partition approaches, and partial enumeration. Local neighborhood search is one of the most powerful approaches. Waidah et al in research of automation detection of blast cell where in this research, local neighborhood search methods is applied in order to optimize the size of a circle capturing potential leukemia cells (Ismail, W. et al. 2010). The focus in

the existing research comprises the use of advanced computational techniques for processing and classification of medical images. This is show the quality of the fitness function enable to determine how well a program can solve a certain problem. Thus, the fitness function seems compulsory to be included in deciding the good optimization algorithm in this research.

2.7 Optimization of disaster relief operation

2.7.1 K-Nearest Neighbor (KNN)

The k-nearest neighbors (k-NN) algorithm is one of the simplest machine learning algorithms. It is simply based on the idea that "objects that are 'near' each other will also have similar characteristics. The k-NN method proposed by (Fix & Hodges, 1951) that was considered of the nonparametric methods used for classification of new object based on training samples and attributes.

The KNN is considered a supervised learning algorithm that a new instance query result is classified based on the K-nearest neighbor category (Castillo, 2008). The advantage of KNN is easy to implement and simple. Thus if we know the characteristic features of one of the objects, we can also predict it for its nearest neighbor. KNN is an improvisation over the nearest neighbor technique (Hassan et al., 2014). It is based on the idea that any new instance can be classified by the majority vote of its 'k' neighbors, - where k is a positive integer, usually a small number. KNN is not negatively affected when training data are large, and indifferent to noisy training data.

Figure 6: The Algorithm of KNN

for *all the unknown samples UnSample(i)*

for *all the known samples Sample(j)*

compute the distance between UnSamples(i) and Sample(j)

end for

find the k smallest distances

locate the corresponding samples Sample(j1),..,Sample(jk)

assign UnSample(i) to the class which appears more frequently

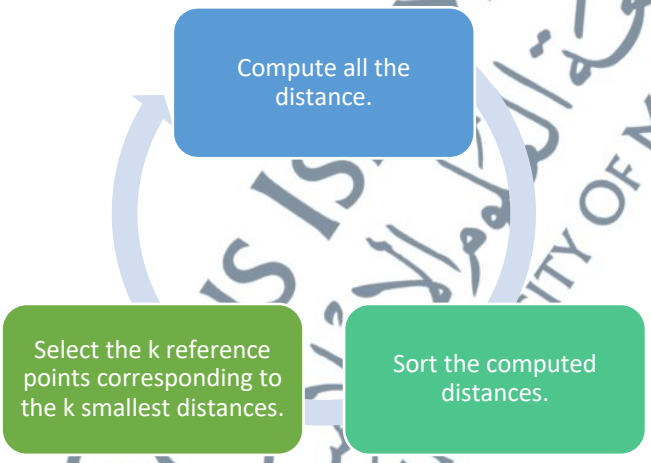
end for

Source: Ahmed M.M. et.al, 2018)

The KNN method applied in many areas such as artificial intelligence, statistical estimation, pattern recognition, categorical problems and feature selection (Ahmed et al, 2018). The need to determine parameter K is regard disadvantage of the KNN method, calculate the distances between the query instance and all the training samples following by sorting the distances and determine the nearest neighbors based on the K minimum distance, additionally determine the categories of the nearest neighbors. The KNN search

problem compose of searching the k nearest neighbors of each point in the reference. Generally, the Euclidean or the Manhattan distance is used but any other distance can be used instead such as the Chebyshev norm or the Mahalanobis distance (Ahmed et al, 2018). The brute force algorithm also called exhaustive search is considered method to search the KNN. The Brute force algorithm firstly computing all the distances, followed by sorting the computed distance. Then, the k reference points corresponding to the k smallest distance is selected.

Figure 7: Brute Force Algorithm Process



Source: Ahmad et al,2018

The use the *k*-means clustering algorithm to cluster the selected subset and find the proper cluster centres as the true cluster centres of the original data set. Based on the cluster centres conducted by Xiaoliang, the rest data points of the original data set are assigned to the clusters whose centres are the closest to the data points (Xiaoliang, 2020).

As KNN is one of the most simple and straight forward data mining techniques, thus, the aim from this technique is to optimized by Simulated annealing and GA algorithm in order to determine best location of distribution centre for disaster relief operation.

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2.7.2 Simulated Annealing (SA)

Simulated Annealing Algorithm (SA) is an extension of local search algorithm, the difference of it from the local search is to select the good cost state within the field in a given probability (Ma et al., 2012). In theory, it is a global optimization algorithm. Through the simulated annealing process, it can find the global (or approximate) optimal solution. The earliest thought of SA was proposed by Metropolis in 1953 (Metropolis et al., 1953), and in 1983 it was successfully applied in combinatorial optimization problems (Kirkpatrick et al., 1983). SAA is a stochastic searching optimization algorithm based on Metropolis iterative strategy, whose starting point is based on the similarity between annealing process of solid material in physical and general combinatorial optimization problems, and a new way of solving optimization problems is opened up (Che and Cui, 2011; Sharma et al., 2011). Initially SA makes the solid to heat at a sufficiently high temperature, with the decreasing temperature parameters, and combining with the probabilistic jumping property randomly finds the global optimal solution of objective function in the solution space, namely it can jump out from the local optimal solution with a certain probability and eventually reach the global optimum (Riverol et al., 2010).

2.7.3 Genetic Algorithm (GA)

Genetic Algorithm is a random search algorithm which evolved from the genetic mechanism of survival of the fittest, which was first proposed by professor J. Holland of University of Michigan in 1975 (Holland, 1975). GA is stimulating the Darwinian principle of natural selection and the survival of the fittest in optimization. It is works with a fixed-size population, uses genetic operations involving crossover and mutation to evolve the solution, and selects the most appropriate offspring to pass on the next generations (Zheng et al., 2015). As a global optimization search algorithm, compared with other optimization search algorithm, genetic algorithm has many unique properties, and it has been successfully applied to combinatorial optimization, machine learning, signal processing, adaptive control, artificial life and other fields.

The optimal shelter locations for flood evacuation planning has been studied (Kongsomsaksakul et al., 2005). They formulated the problem using a bi-level programming model, with the upper level for location and the lower level for traveler behavior. They developed a GA that uses genetic operations to evolve a population of complete solutions, and employs a double-stage algorithm to evaluate the fitness value of each chromosome. Next is the approach of optimizing the location of catastrophic rescue centres, (Wang & Zhang, 2005) presented a model taking account of the probability of disaster occurrence, disaster diffusion function and rescue function, and developed a GA using binary encoding and embedding a greedy heuristic for fitness calculation. Experiments on examples arising practice show that the algorithm provides satisfactory results.

Jia et al. 2007 proposed a maximal covering problem model by considering the facility locations of medical supplies, where the demand uncertainty and medical supply insufficiency are addressed by providing each demand point with services from a multiple quantity of facilities that are located at different quality levels or distance. Three heuristics including a GA are developed for the location problem, and the experiments show that the GA is appropriate for small problems but produce less quality solutions on large problems mainly because of premature convergence.

In order to determine the optimal number and locations of fire stations at an international airport, (Tzeng & Chen,1999) proposed a fuzzy multi-objective model, the objectives of which include minimizing the total setup cost and minimizing the longest distance from the fire stations to any incident point. The objectives are con-verted to a single unified 'min-max' goal, and a GA is employed for effectively solve the problem. An effort to extend the model such that different risk categories and obstacles within a given region are considered in the objectives and constraints, and adapted the GA by embedding the constraints into the fitness function (Yang et al. 2007).

Following 4 years, a studied of an highway traffic emergency facility location problem, and proposed a heuristic GA which uses an n-dimensional 0–1 integer vector to present chromosomes, and employs a heuristic operator for improving unreliable chromosomes by (1) remedying the chromosomes that do not cover all demands and (2) eliminating the redundancy of chromosomes that cover the location set with redundancy (Chai et al., 2011).

The method has been successfully applied to problems from the highway network of Nanjing, China.

Han and Zhang, 2009 studied an extended emergency facility location problem which is modeled as an IP problem, and proposed a GA where each chromosome is constituted by the serial number of each target's emergency facility, and population diversity is maintained by using a changeable mutation probability. Experiments show that the GA solve the problem much more efficiently than other simple heuristics.

2.8 Summary

In summary, from the literature review the findings is from the selection of a small subset from the original data set based on a set of nondegenerate observation points in the first stage. The research gap here is the *k*-nearest neighbors (*k*NN) method to improve the selection of observation points and the real applications for the two-stage *k*-means clustering algorithm can be improved. From previous finding by (Xiaoliang, 2020). In the second stage of the process, they use the *k*-means clustering algorithm to cluster the selected subset and make these cluster centres as the true cluster centres of the original data set. The theoretical analysis and experimental verification demonstrate the feasibility and effectiveness of proposed clustering algorithm. Hence, the problems in selection of distribution centre is not optimum. Mostly, the volunteer did not cover the area of disaster equally. There area a few solution using K-Means algorithms. And the comparison between three algorithms which are K-Means, K-Means with Simulated Annealing, K-Means with Genetic Algorithms.