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Sense an Elusive Threat (Now Old Age has Nowhere to Hide)

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NO CONFLICT OF INTEREST

PREPHASE

The only thing that comes uninvitedly is old age. A life-threatening condition. Sense an elusive threat. A controversial life. Now old age has nowhere to hide.

In fact, advancing age is the major risk factor for a number of chronic diseases in humans. Aging is a major risk factor for most common neurodegenerative diseases, including mild cognitive impairment, dementias including Alzheimer's disease, cerebrovascular disease, Parkinson's disease, and Lou Gehrig's disease. Wear and tear theories of aging suggest that as an individual age, body parts such as cells and organs wear out from continued use. Wearing of the body can be attributable to internal or external causes that eventually lead to an accumulation of insults which surpasses the capacity for repair. Due to these internal and external insults, cells lose their ability to regenerate, which ultimately leads to mechanical and chemical exhaustion.Old age refers to ages nearing or surpassing the life expectancy of human beings, and is thus the end of the human life cycle.

Key Words Alzheimer's disease, cerebrovascular disease, Parkinson's disease, Lou Gehrig's disease. Cytokine dysregulation, Tauopathy, Gerontology,

1 Introduction

Cytokine dysregulation is believed to play a key role in the remodeling of the immune system at older age ,which seems to be a marker of unsuccessful aging.(1)

It is a dynamic network that is continuously remodeling throughout each person's life as a result of the interaction between our genes, lifestyles, and environments (2–3).

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The cytokine network is a highly complex system of immune molecular messengers, with multiple layers of diverse serum mediators, as well as gene polymorphisms (4).

Today there is increasing of diverse human diseases ranging from , cardiovascular pathology, diabetes, metabolic syndrome, neurodegeneration, and cancer, to aging itself (5.6,7).

Aging is a ubiquitous biological phenomena, characterized by ever-increasing susceptibility to diseases - mitochondrial damages, and ultimately death.(8)

Aging is an ubiquitous biological phenomena characterized by ever-increasing susceptibility to diseases due to increased oxidative stress (OS).(9)

Current evidence suggests both resveratrol and pterostilbene may be modulators for aged-related neurodegeneration, obese, diabetes, and cardiovascular diseases.(10)

Brain aging is mainly characterized by a progressive metabolic imbalance, brain vasculature alterations, and a decline in adult neurogenesis, among other signs (11), leading to a cognitive and motor decline, not only in the context of neurodegenerative diseases (12)

The most important risk factor for PD is aging. Alterations in mitochondrial activity are typical of aging.. 13)

Mitochondria are intracellular organelles deriving and storing energy through the respiratory chain by oxidative phosphorylation (14,15)

Aging is a process characterized by the progressive loss of tissue and organ function. 16)

Neurofibrillary tangles (NFTs) correlate more closely with the severity of dementia than plaque counts (17,18). The association of tangles with a variety of brain damage supports the “tauopathy” concept of neurodegeneration (19).

The brain is highly susceptible to an oxidative imbalance due to its high-energy demand, high oxygen consumption, (20).

2 Significant Gap in Research

Brain function declines with age and is associated with diminishing mitochondrial integrity.Mitochondrial dysfunction may be a principal underlying event in aging, (21).

Mitochondrial membrane potential, respiratory control ratios and cellular oxygen consumption decline with age and correlate with increased oxidant production (22,23). Mutations in genes that encode mitochondrial proteins could compromise mitochondria by altering components of the electron transport chain (24)

Neurofibrillary tangles (NFTs) correlate more closely with the severity of dementia than plaque counts (25). The association of tangles with a variety of brain damage supports the “tauopathy” concept of neurodegeneration(26).

The brain is highly susceptible to an oxidative imbalance due to its high-energy demand, high oxygen consumption, (27).

The incidence and severity of cerebrovascular disease (CVD) increase with advancing age, as does the risk of developing Alzheimer's disease (AD). (28)

L-Carnitine and acetyl-L-carnitine (ALC) are both used to improve mitochondrial function..(29)

L-Carnitine facilitates entry of long-chain fatty acids into mitochondria for utilization as fuel (30)

Developing therapeutic interventions for such conditions demands a greater understanding of the processes underlying normal and pathological brain ageing.(31) Alzheimer's disease, which now affects almost 50% of adults over the age of 85 in the United States (32).

The sequence of the human genome represents our genetic blueprint, and accumulating evidence suggests that loss of genomic maintenance may causally contribute to aging.(33)

Aging is a major risk factor for neurodegeneration, cancer, and other chronic diseases (34)

3 History

In the medieval Islamic world, several physicians wrote on issues related to Gerontology. Avicenna's *The Canon of Medicine* (1025) offered instruction for the care of the aged, including diet and remedies for problems including constipation (35) Arabic physician Ibn Al-Jazzar Al-Qayrawani (Algizar, c. 898–980) wrote on the aches and conditions of the elderly (Ammar 1998, p. 4) (36) His scholarly work covers sleep disorders, forgetfulness, how to strengthen memory (37,38)and causes of mortality (39) Ishaq ibn Hunayn (died 910) also wrote works on the treatments for forgetfulness (U.S. National Library of Medicine, 1994)(40)

Some early pioneers, such as Michel Eugène Chevreul, who himself lived to be 102, believed that aging itself should be a science to be studied. Élie Metchnikoff coined the term "gerontology" 1903 (41)

Modern pioneers like James Birren began organizing gerontology as its own field in the 1940s, later being involved in starting a US government agency on aging – the National Institute on Aging. (42)– programs in gerontology at the University of Southern California and University of California, Los Angeles, and as past president of the Gerontological Society of America (founded in 1945) (43)

With the population of people over 60 years old expected to be some 22% of the world's population by 2050, assessment and treatment methods for age-related disease burden. (44,45,46)

4 Where the Research Go Next?

Many disorders are multifactorial in origin and are best managed by multifactorial interventions. Diseases often present atypically.Not all abnormalities require evaluation and treatment.Complex medication regimens, adhered problems, and polypharmacy are common challenges.Functional screening should include assessment of ADL and IADL and questions to a detect weight loss, falls, incontinence, depressed mood, self neglect, fear for personal safety, and common serious impairments (e.g. hearing, vision, cognition, and mobility).. it may indicate early impairment, such as dementia, incontinence, or worsening hearing loss, which additional gentle questioning or assessment may uncover.Choice of antidepressant agent in elders is usually based on side effect profile and cost. Citralopram and sertraline are often used as first-line agents because of their low side-effect profiles.(47)

Neuronal loss, cochlear degeneration, increased lens rigidity, lens opacification, anterior horn cell loss, dorsal column loss and slowed reaction time. Clinical consequence of age related CNS abnormalities which includes, increased risk of delirium, presbyacusis/high-tone hearing loss, cataract, muscle weakness and wasting, reduced position and vibration sense and increased risk of falls.Reduced lung elasticity and alveolar support, increased chest wall rigidity, increased V/Q mismatch, reduced cough and ciliary action. Clinical consequence of age related respiratory system abnormalities which includes, reduced vital capacity and peak expiration flow, increased residual volume, reduced inspiratory reserve volume, reduced arterial oxygen saturation and increased risk of infection.Reduced maximum heart rate, dilation of aorta, reduced elasticity of conduit/capacitance vessels and reduced number of pacing myocytes in sinoarterial node.

Clinical consequence of age related cardiovascular system abnormalities which includes, reduced exercise intolerance, widened aortic arch on X-ray, widened pulse pressure, increased risk of postural hypotension and increased risk of arterial fibrillation.Deterioration in pancreatic β-cell function.

Clinical consequence of age related endocrine system abnormalities which includes, increased risk of impaired glucose tolerance.Loss of nephrons, reduced glomerular filtration rate and reduced tubular function.

Clinical consequence of age related renal system abnormalities which includes, impaired fluid balance, increased risk of dehydration/overload, impaired drug metabolism and excretion.Clinical consequence of age related gastrointestinal system abnormalities which includes, constipation and risk of colon cancer.Reduced bone mineral density. In ageing increased risk of osteoporosis and fractures.(48)

5 Major Advances and Discoveries

Age has important influence on the likelihood of being afflicted with cancer..Tragically, children are not spared; cancer accounts for slightly more than 10% of all deaths in the Unites States, second only to accidents. However the types of cancers that predominate in children are significantly different from those seen in adults. Canomas, the most common general category of tumors in adults, are extraordinarily rare among children.The common neoplasms of infancy and childhood include the so-called small round blue cell tumors such as neuroblastoma, Wilms tumor, retinoblastoma, acute leukaemias, and rhabdomyosarcomas. (49)

Just a few years ago, researchers believed that low levels of zinc in the body might contribute to the development of Alzheimer's. However, when scientists at the University of Melbourne in Australia tested the zinc theory, they got disastrous and totally unexpected results.(50)

While some researchers found excessive aluminum in the brain tissues of Alzheimer's sufferers, other scientists said the aluminum came from chemical agents the researchers used to analyze the brain tissue.

Animal studies seem to show an aluminum / Alzheimer's link. When researchers injected aluminum into the brains of rabbits and cats, changes in their behavior and their brain mimicked changes in Alzheimer's victims.

People with kidney failure who have undergone dialysis fluid is made from water containing large amounts of aluminum. This condition is called dialysis dementia.

An experimental drug that draws aluminum out of the body seems to slow down the progression of Alzheimer's disease.

You may have heard that taking an aspirin every day can ward off stroke and heart disease, but now there may be another unexpected benefit.

Some Alzheimer's experts believe that aspirin, ibuprofen, naproxen and other nonsteroidal anti-inflammatory drug (NSAIDs) commonly recommended for arthritis can prevent Alzheimer's disease.

That's the finding of a recent study of 50 pairs of elderly twins. Only one of each set of twins had used NSAIDs. That twin was less likely to develop Alzheimer's disease or developed it years later than the other twin.

You need to talk to your doctor before you begin taking an aspirin a day, though. NSAIDs can cause ulcers and bleeding in your stomach, so you have to weigh your individual risk of heart disease, stroke and Alzheimer's against your risk of stomach problems and bleeding.(51)

Alzheimer's disease (AD) is the most common cause of dementia in older adults, with an increasing incidence as a function of age. The disease usually becomes clinically apparent as insidious impairment of higher cognitive functions. As the disease progresses, deficits in memory, visuo-spatial orientation, judgement, personality and language emerge. Typically over a course of 5 to 10 years, the affected individuals becomes profoundly disabled, mute, and immobile. Patients rarely become symptomatic before 50 years of age; the incidence of the disease increases with age, and the prevalence roughly doubles every 5 years, starting from a level of 1% for the 60- to-64-year-old cohort. His progressive increase in the incidence with increasing age has given rise to major medical, social, and economic concerns in countries with aging populations. About 5% to 10% of cases are familial forms of AD; these have provided important insight into the pathogenesis of the more common sporadic form of the disease. While pathologic examinations of brain tissue remains necessary for the definitive diagnosis of AD, the combination of clinical assessment and modern radiologic methods allows accurate diagnosis in 80% to 90% of cases as confirmed at autopsy.(52)

6 Current Debate

Supported by Hanover, Independent Age, British Red Cross and PA Consulting Group, the big aging population debate includes three fringe events at the party conferences, as well as two seminars at the Guardian's London HQ. An online series of live discussions, features and debate will explore the issues facing older people, their families and those running the services that support them. (53) In the future, the escalation in human lifespan will depend on healthier lifestyles and the availability of improved biomedical advances and biotechnologies. With scientific interventions and environmental improvements, we may be confident that aging will slow down over the course of the current century.(54)Experiments conducted in old mice, have shown that age-related DNA damage diminishes when the cellular level of NAD+ is increased.(55) Another study just published in Nature,demonstrates the role of renewed neuro-stem cells (NSCs) in the hypothalamic region of the mouse brain.(56)Human life expectancy has steadily increased since the nineteenth century. Reports of

supercentenarians — people such as Clement who live to older than 110 — together with observations of model animals whose lifespans can be extended through genetic or dietary modifications, have prompted some to suggest that there is no upper limit on human lifespan. Others say that the steady increase in life expectancy and maximum human lifespan seen during the last century will eventually stop (57)

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Sources and Management of Sustainable Waste

Case Study: Sultan Hasanuddin International Airport Makassar South Sulawesi Indonesia

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ABSTRACT

The research aims to find out the source of garbage from various object activities and find out the waste management system at Sultan Hasanuddin International Airport, Makassar South Sulawesi Indonesia. The study was conducted in September 2015 at Sultan Hasanuddin International Airport in Makassar, South Sulawesi through a survey in the form of interviews, direct observation. Taking and measuring samples at places where there are human activities and points that are considered to represent samples, such as in public services. The focus of research is on the Land Side of the Airport based on the SNI 19-3964-1994 method. which is used in this research is a quantitative approach by calculating the weight and volume of waste generation from each sample point. Of the ten samples observed, the waste generation was obtained at; check in area 74.8 ltr, departure area 20.06 ltr, arrival area 46.8 ltr, public service 96.6 ltr, service office 2.42 ltr, luaggage 52.4 ltr, cargo 208 ltr, minimarket / café 87.3 ltr, restaurant 155.3 ltr and vehicle parking 231.4 ltr. The waste management system is carried out through the 3R method; namely Reduce: 27.29% waste management, Reuse: 36.37% waste management, Recycle: 33.7% waste management and the remaining 2.64% waste is disposed of to landfills.

1 Introduction

Waste is waste material both from animals, humans, and plants that are no longer used and disposed of into the environment in the form of solids, liquids or gases. Waste is one of the main problems in the world, such as in Indonesia which requires good management. Waste is waste material that is discarded because the material is considered to be worthless, does not have economic value so it is disposed of into the environment and because of its nature, concentration and / or volume, it requires special management (Natsir Abduh, 2016).

In the Law of the Republic of Indonesia No. 18 of 2008, it was said that waste problems cover many aspects, therefore management must be carried out comprehensively and integratedly. New, more adequate innovations are needed in terms of all aspects; such as social aspects, economic aspects and technical aspects from upstream to downstream in order to provide economic benefits, be healthy for the environment, and can change people's behavior.

The airport is the gateway of a country that becomes access to various political, socio-cultural, economic and tourism aspects. Besides that airports also help a lot in the economic and social development of the

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surrounding community, but on the other hand the operation has a negative impact. Activities at airports produce waste in the form of waste containing materials that are harmful to humans. Waste thrown into the environment can reduce environmental quality. If this situation continues without regard to natural capabilities, the concept of sustainability will not be achieved (Natsir Abduh, 2016).

Waste materials at the airport are sourced from passengers, visitors, crew, airport staff, cleaning plants, commercial activities, aircraft maintenance and building maintenance. Activities at the airport will increase the amount of solid waste, most of which is domestic waste and Hazardous Toxic Material. Hazardous Toxic Material in the form of waste comes from aircraft maintenance, such as used oil that is wasted around aircraft hangars (Adisasmita and Hadipramana, 2011). Airport operation is required for an environmental quality control system to be a high priority, such as noise, air quality, waste management, waste management, and environmentally friendly activities (Natsir Abduh, 2016).

Waste management at Sultan Hasanuddin International Airport needs to be done effectively and efficiently by taking into account the functional elements of waste management. Waste is obtained in the form of food scraps, plastic, paper, cans and trash remnants on the yard. The biggest composition of the waste source that most generates waste generation is paper (Leony Yermina A, Mery Salintung and Irwan Ridwan R, 2014).

One of the concepts of Environmental Sustainability Management can be done using the 3R method. This method is in the form of; Reuse, which is the reuse of an item that is not used for other purposes, without the need to experience a production process. Reduse, which is reducing waste production. Recycle, which is reprocessing the waste produced into other goods with higher value (Pranata Dedy, 2014).

Community-based waste management with the 3R concept aims to reduce waste starting from its source, reduce environmental pollution, provide benefits to the community, and can change people's behavior towards waste. The 3R concept is actually very simple and easy to implement, but it is difficult to implement because the success of the 3R concept is largely determined by people's participation by changing their behavior which is generally influenced by the socio-cultural character and socio-economic character. The changing paradigm of the community in waste management must start now (Natsir Abduh, 2015).

The application of the 3R concept in managing waste in a self-managed manner by the community by changing the behavior of "throwing" garbage into "managing" garbage is one of the sustainable concepts. Sustainable development that is environmentally sound is a conscious and planned effort that integrates the environment, including resources into the development process to ensure the ability, welfare and quality of life of present and future generations. This concept states that sustainable development meets the needs of the present without having to reduce the ability to meet the needs of future generations. Sustainable development must pay attention to environmental use and environmental sustainability so that the quality of the environment is maintained, so that the carrying capacity of the environment is not reduced or lost. The meaning of sustainable development is that social justice from generation to generation has been achieved (Dorodjatun, K., 2011).

This research was conducted in September 2015 and aims to find out the source of garbage from various object activities and find out the waste management system at Sultan Hasanuddin International Airport, Makassar South Sulawesi.

2 Research Method

The research was conducted through a survey in the form of interviews, direct observation of the waste management system, retrieval and measurement of generation samples and the composition of waste using the SNI 19-3964-1994 method. The collection of garbage samples from several points considered to represent activities at the airport, including parking of vehicles, passenger terminals and aircraft hangars. The focus of research is on the Airport Side, so that the sample points are in that area.

Pendekatan yang digunakan dalam penelitian ini adalah pendekatan kuantitatif melalui perhitungan berat dan volume timbulan sampah dari masing-masing titik sampel. Waste samples are collected, separated according to their type or composition. The sample is weighed and then put into a measuring vessel provided with a size (20 x 20 x 100) cm and compacted. The volume of waste is obtained by knowing the height of the waste in the measuring vessel.

The data obtained is studied and analyzed in depth on the sources and amount of waste generated and the waste management system. Survey data is the basis of planning in the waste management system carried out at Sultan Hasanuddin International Airport.

3 Research Result

3.1 Waste Source

Garbage is a problem in every city, including in Indonesia, which eventually accumulates in the Final Disposal Site. Garbage comes from the terminal building area, vehicle parking and some supporting facilities at Sultan Hasanuddin International Airport. Observed sources of garbage; such as in the minimarket, restaurant, café 'area, employee room, public service area, check-in area, departure room, arrival room, and vehicle parking.

The following is a picture of the source and amount of waste generated at Sultan Hasanuddin-Makassar International Airport in several locations studied.

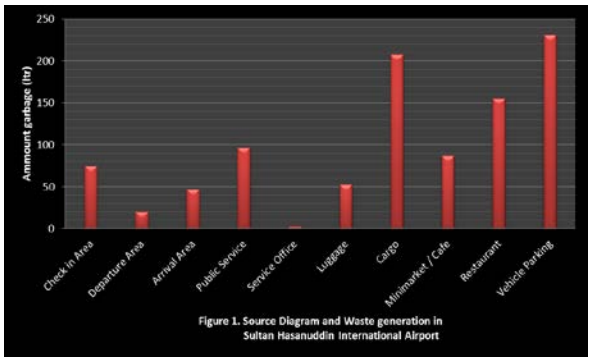


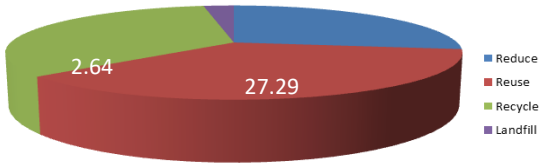
Figure 1. Source Diagram and Waste generation in Sultan Hasanuddin International Airport

In figure 1 shows the amount of waste generated at the check in area as much 78.8 ltr, departure area 20.06 ltr, arrival area 46.8 ltr, publik service 96.6 ltr, service office 2.42 ltr, luaggage 52.4 ltr, cargo 208 ltr, minimarket/café 87.3 ltr restaurant 155.3 ltr and vehicle parking 231.4 ltr.

3.2 Waste Management System

Waste management at Sultan Hasanuddin International Airport is currently implementing a system that is container-collecting-dumping. Disposal is carried out at the Temporary Disposal Site within the airport area, approximately 700 meters from the terminal building. In this place, the 3R system is processed (Reuse, Reduce and Recycle) so that the waste is not all disposed of to the Final Disposal Site.

The following is described the waste management system and the amount of waste managed through the system.



Source: Analysis results

Figure 2. Percentage of Waste Generation and Processing System

Based on the picture above, the amount of waste generated is 9,750 liters or 9.75 m^3 every day. The amount of generation that can be recycled is 33.7%, reduse is 27.29% and reuse is 36.37%. The remaining 2.65% of waste that can be processed is transported to the Tabbangae Final Disposal Site in Maros Regency, South Sulawesi Province.

4 Discussion

4.1 Passenger of Sultan Hasanuddin International Airport

The results of the waste generation are due to human activities at the airport which every time increases along with the increasing number of passengers at Sultan Hasanuddin International Airport. This increase resulted in airport capacity not being met with plans to only accommodate 7 million passengers every year. Sultan Hasanuddin International Airport is included in the management of PT. Angkasa Pura I, which consists of several airports in Indonesia as shown in the map of the following airport locations.

HEADQUARTERS

Figure 3. Location Map and Airport Name of PT. Angkasa Pura I

The number of passengers continues to increase along with the economic growth of South Sulawesi which is supported by economic development and development in the eastern region also starting to improve. The ability of the community to influence the use of aircraft as one of the transportation in the

trip. The following is a graph of the increase in the number of passengers at Sultan Hasanuddin International Airport.

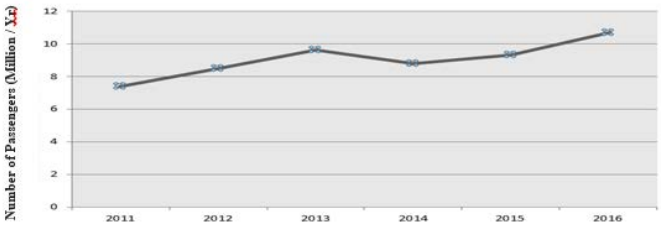


Figure 4. Graph of Increasing the Number of Passengers Sultan Hasanuddin International Airport

The overcapacity condition began to occur in 2011 with a total passenger number of 7.4 million people, in 2012 there were 8.5 million people, while in 2013 there were 9.6 million people. In 2014 there was a decline in passenger traffic but it was still above the existing capacity of the airport terminal, which is 8.8 million people. Then it experienced aggressive growth in 2015 to 9.3 million people and in 2016 it increased to 10.68 million people (Angkasa Pura I, PT. 2010).

The results of the analysis show that the increase from 2011 to 2013 was around 12.9%. This development is estimated that by 2020 passengers will reach 15.08 million people.

4.2 Sources and Characteristics of Waste

4.2.1 Waste Source

Judging from the source, the garbage at Sultan Hasanuddin International Airport can be divided into:

a. Garbage Terminal Building
The source of garbage in the terminal building is food scraps and the most sourced from restaurants and cafés. Besides that there are also plastic, paper and cans.

b. Garbage Vehicle Parking
The source of garbage in the parking lot of the vehicle comes from plants in the parking lot of the vehicle in the form of wood and leaves. There are even restaurants that can cause garbage in the form of plastic and paper.

c. Waste Cargo
This cargo waste can be in the form of food scraps, plastic, paper and cans.

d. Aircraft Hangover Garbage
Hangar waste due to maintenance or repair of aircraft. A lot of garbage is used oil.

4.2.2 Characteristics of Waste

Garbage comes from the terminal building area, vehicle parking and some supporting facilities at Sultan Hasanuddin International Airport. Several sources of waste are observed; such as in the minimarket, restaurant, café 'area, employee room, counters, check-in area, departure room, arrival hall, vehicle and cargo parking.

The characteristics of waste are needed to plan waste management, for example equipment used, pattern of collection, methods of destruction and so on (Gultom, Osmen. 2002). To find out the

characteristics of waste, research is needed both in the field and in the laboratory. Among the characteristics of waste that need to be known are (Alex S. 2012):

a. Garbage

Food waste comes from animals, vegetables and fruits come from management activities, preparation, cooking and leftovers.

Its main characteristics are humid, high water content, easily decomposed especially in areas such as Indonesia which have hot climates where weathering occurs faster.

The source of garbage is mainly from restaurants, cafés and employees who bring food from home.

b. Rubbish

The characteristics of this garbage are not easy to rot and are divided into two groups, namely:

- can be combustible for example; paper, cardboard, plastic, rubber, textile, wood and leather.
- non combustible for example; glass, cans, alumium, metal and dust.

c. Special waste

Solid waste generated from road sweeping activities, or drain cleaning. In the form of animal carcasses, paper, plastic, plants and cans.

There are characteristics of this garbage that are easily burned and destroyed and some are difficult to recycle.

4.2.3 Waste Management

Waste management can be carried out through a number of systems or methods, but what is simple and easy to do is implementing the 3R system; namely Reduce, Reuse and Recycle. This system is usually garbage can not be managed as a whole because it is influenced by the characteristics of the waste, so that the approach and equipment used must be appropriate (Yuni Puspitawati, Mardwi R, 2012).

a. Reduce

The reduce method is applied at Sultan Hasanuddin International Airport through providing education to the airport community on how to reduce the use of goods or objects that are not really needed. This information is carried out by containing:

- Reduce the use of plastic bags once used and then discard. Plastic bags are rubbish that need hundreds of years (200-300 years) to decompose.
- Prioritizing buying a container product, so it can be refilled.
- Repair damaged items (if they can be repaired).
- Reducing the use of disposable ingredients.

The results of the analysis showed that the waste processed through the reduse method amounted to 27.29% derived from plastic and tin waste.

b. Reuse

This method is carried out through the use and reuse of unused items into something new. This method is carried out by workers from the community who live around Sultan Hasanuddin International Airport.

This garbage is in the form of; used newspapers, cardboard boxes, milk cans, soap containers. These items can be utilized as best as possible.

- Say used goods become goods that can be reused.
- Reusing plastic bags shopping for the next shopping.

The results of the analysis showed that the waste processed through the reuse method was 36.37% which came from paper and fabric waste.

c. Recycle

Recycle used goods into items that can be reused through Insenerator tools.

- Organic waste can be used as fertilizer.

- Inorganic waste can be recycled into something that can be reused. The material is in the form of; paper, plastic bottles.

The results of the analysis showed that the waste processed through the recycle method was 33.7%, which came from leftovers, leftovers and wood. The results of this recycle are used as compost.

Development of alternative management methods with Insenerator tools, in order to optimize the process of managing waste produced, so as to reduce the volume of waste entering the Final Disposal Site Processing waste against waste that can be recycled to produce efficient and effective management.

If recycle is done, the use of a portion of the waste from processing results can be reused, so that airport operating costs can be reduced. The volume of waste to be transported to the Final Disposal Site (TPA) is reduced, so that the costs of mobilizing waste will also be reduced. The following is a picture of the percentage diagram of the generation and waste treatment system at Sultan Hasanuddin International Airport.

The results are from 9,750 liters or 9.75 m75 every day. The amount of generation that can be recycled is 33.7%, reduse is 27.29% and reuse is 36.37%. The remaining 2.65% of waste Final Disposal Site in Maros Regency, South Sulawesi Province.

5 Conclutions

1. The results of waste generation from the ten samples observed were found to be solid waste at; check in area 74.8 ltr, departure area 20.06 ltr, arrival area 46.8 ltr, public service 96.6 ltr, service office 2.42 ltr, luaggage 52.4 ltr, cargo 208 ltr, minimarket / café 87.3 ltr, restaurant 155.3 ltr and vehicle parking 231.4 ltr. The highest amount of garbage in vehicle parking is 231.4 ltr and at least in the service office as much as 2.42 ltr.
2. The waste management system is carried out through the 3R (Reduce, Reuse, Recycle) method and the rest is discharged to the Waste Disposal Site in Tabangae area, Maros Regency, South Sulawesi Province. Waste management through the Reduce system is 27.29%, Reuse is 36.37%, Recycle as much as 33.7% and the remaining 2.64% of waste is **disposed to landfills.**

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A Novel Approach for Segmentation of Brain Image using a Multiscale Transform and a Region Based Active Contour

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ABSTRACT

Over the Past decade Medical Image segmentation is one of the most challenging and focused topic for intensive research in interdisciplinary areas of Image processing and computer vision. Segmentation is the process of automatic or semi-automatic detection of boundaries [5]. In this paper, we implement a novel unsupervised method for segmenting MRI brain Images based on multiresolution transforms and region based active contour. Application of multiscale, multiresolution methods with active contour is most interesting research topic in image segmentation [6].This new application makes segmentation algorithms more economical for computation.

Keywords: Multiscale and Multiresolution Transform, Chanvese active contour, Curvelet transform

1 Introduction

Segmentation is a fundamental operation on Medical image Analysis. Segmentation effectively partitions the image into homogeneous (segments) groups of common feature vectors that comprises gray levels, motion, texture etc. Boundary detection is an integral part of this process since it helps to identify the individual segments themselves. In this paper we propose an integrated segmentation approach that combines a gradient based Active contour method and multiscale Curvelet transform which is a sparsifying transform method to resolve the problem of intensity inhomogenity of Medical images, to reduce the computational cost and enhance the search for the global minimum. This proposed method promises to recognize weak edges and strong noises. This method was developed based on the inspired ideas of multiresolution wavelet transform hybrid with Active contour approaches. Curvelet is multidirectional, multiscale geometric wavelet transform [21]. Curvelet transform is relatively new multiresolution [20] analysis technique for sparse coding [optimal sparse representation [23] of objects and edges]. Curvelet produces the edge map of objects by Curvelet thresholding instead of simple gradient methods. In addition to this we also use the Mumford-Shah model based Chanvese active contour method for efficient image segmentation [22]. The Chanvese active contour is also a geometric active contour. Region based active contour model (ACM) utilizes the objective and the background regions statistically to find optimum energy. Due to which advantages over edge based ACMs, Region based ACMs are more popular for their robustness for image with weak

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edges or without edges. The Chanvese (CV) model is one of the most popular region based models [10]. In this paper we use a region based active contour method which ignores edges completely ("Active Contours without Edges" method by Chan and Vese [23]). Active contour models (ACMs) based segmentation methods have gained popularity due to their sub pixel accuracy as they provide closed and smooth edges.

2 Literature Survey

Curvelet transform is typically applicable in Medical image analysis for detecting intrinsic geometric curve like structures that forms a large portion of the medical images [15].Curvelet transform was initially introduced by Candes and Donoho[16]. Curvelet transform decompose the image into sub bands and separate the object into a series of disjoint scales. Curvelet thresholding is implemented for denoising[17,18,19], which proves efficient than gradient methods for recognize edges weak edges and as well as strong noises. A higher Curvelet coefficient corresponds to a stronger edge and the noise corresponds to a smaller coefficient. So by choosing Proper threshold, we retain the bigger coefficient and abandon the smaller coefficient to achieve the image denoising. Active contours are a catch-all name for methods that find the curve that best separates objects in an image. This is known as segmentation [1]. The concept of Active contour (AC) models for segmentation the original model were initially proposed by Kass et al[13].This classical approach drives an initial contour towards the boundaries of the objects by minimizing an energy function whose minimum is obtained at the boundaries of the object(s). Chanvese active contours [26] establish the most robust and efficient method of image segmentation than the classical methods of histogram, thresholding, gradient based methods etc. Chanvese method of segmentation is a special case of Mumford-Shah functional model. This method of segmentation is used widely in the medical imaging field, especially for the segmentation of the liver, brain, heart etc [29].The Chanvese model solves problems of curve evolution in the parametric active contour model and extends the application region of the active contour model. Chanvese [CV] model, also known as PC (piecewise constant) model, proposed in [25], is a simplified Mumford-Shah function. The model utilizes the global mean intensities of the interior and exterior regions of images. Thus, it has good segmentation result for the objects with weak or discrete boundaries but often has erroneous segmentation for images with intensity inhomogeneity. However, due to technical limitations or artifacts introduced by the object being imaged, intensity inhomogeneity often occurs in many medical images [31].

In section5 the level set formulation of the Chan-Vese model is described using a semi-implicit gradient descent.

Some of the limitations of Active contours are stated as follows:

1) The main drawback of these classical and traditional active contour models is that it depends on curve parameters, which cannot handle topology changes of the curve(s) automatically.

2) The curve evolution speed is very slow, as a result convergence is also slow and the level set formulation requires reinitialization at every step during evolution.

3) AC method has a great sensitivity to noise which may yield false segmentation results. Meanwhile, for noise images, the gradient descent flow requires much more expensive computation and iterations to force the active curve(s) to converge.

Combining a multiscale, multiresolution transform such as Curvelet transform with Active contour models can effectively and intuitively solve those problems of Noise inhomogenity [13]. Firstly, with the coarse-to-fine scale and small-to-big size strategies, the Activecontour models cost less expensive for computation because the rough segmentation results of the coarse scale maps can be taken as the initial contour of the following scale map. The multi-resolution strategy has more robust and strong ability to reduce the effect caused by noise [14].Wu et al., (2000) [2] proposed a directional image force for active contours based on wavelet frames. The wavelet-based snakes are helpful for noise suppression. Mignotte and Meunier (2001),[3]presented a multiscale approach for deformable contour optimization relying on a multigrid coarse-to-fine relaxation algorithm. Liu and Hwang (2003),[8]proposed an integrated wavelet-based snake model for segmentation and tracking based on the coarse-to-fine strategy. Bresson et al., (2006)[9] applied linear scale space into the parametric snake model. In this paper a Curvelet transform based geometric active contour is proposed for image segmentation of multiple objects. Curvelet denoising [17, 18] with proper threshold is superior to gradient methods as it promisingly recognize the weak edges and robust for strong noises. Alvino et al., [2005] have proposed a research thesis on novel multiscale active contour methods to several problems in computer vision, especially in simultaneous segmentation and reconstruction of tomography images [10].Multiscale image transforms like wavelets provide a directional image force for active contours, applying multiscale methods to snakes is one of the hot topics in image segmentation [11].

3 Methodology

3.1 Curvelet Multiscale transform for Image segmentation

FDCT can be implemented in two ways. First method is based on unequally spaced fast Fourier transform (USFFT) and the second is based on the Wrapping of specially selected Fourier samples. Both FDCT's differ by spatial grid used to translate Curvelet at each scale and angle and both FDCTs run in O (n2 log n).It is efficient for those images that display curve punctuated smoothness.

Fast Discrete Curvelet transform (FDCT) [24] takes as input a Cartesian grid of the form 0 , and outputs a collection of coefficients C^D (j, l, k) defined by where are digital Curvelet waveforms which preserve the listed properties of the continuous curvelet.

For a Cartesian array f[$n_1 n_2$] , where 0$\leqslant$n$\leqslant n_1$ and 0$\leqslant$n$\leqslant n_2$ and $n_1 n_2$ are dimensions of the array collection.

Curvelet coefficients C^D (j,l,k) indexed by a scale j, an orientation l and spatial location parameters k and is given by

$$C^D(j,k,l) = \sum_{n_1,n_2} f(n_1,n_2)\emptyset^D_{j,l,k}(n_1,n_2)$$

$$f(n_1,n_2), 0 \leq n_1,n_2 < n, 0$$

$\emptyset^D_{j,l,k}(n_1,n_2)$ is the digital curvelet waveform. Eqn [1] This is a part of Reiz representation.

Curvelet transform = IFFT [FFT (Curvelet) x FFT (Image)], and the product from the multiplication is a wedge.

Fast discrete curvelet transform via frequency wrapping is obtained from the following steps:

1. Apply the 2D fast Fourier transform (FFT) and obtain Fourier samples f^ [n1,n2], where −n/2 ⩽n1, n2< n/2.

2. For each scale j and angle l obtain Ũj, ℓ [n1, n2] f^ [n1, n2] by forming the product with Cartesian window

3. Wrap this product around the origin f`j,ℓ[n1, n2]=W(Ũj,ℓf^)[n1,n2] where the range for n1 and n2 is now 0 ⩽ n1< L1,j and 0 ⩽n2< L2,j and θ in the range (- π /4 , π /4).

4. Apply the inverse 2D FFT to each and hence collecting the discrete coefficients f`j,ℓ hence collecting the discrete coefficients CD(j, ℓ, k)[1].The software package CurveLab is used in implementing the Curvelet transform.

3.2 Mumford and Shah Minimization problem

The **Mumford–Shah functional** is a functional that is used to establish an optimality criterion for segmenting an image into sub-regions. An image is modeled as a piecewise-smooth function. The functional penalizes the distance between the model and the input image, by minimizing the functional one may compute the best image segmentation. The functional was proposed by mathematicians David Mumford and Jayant Shah in 1989[27].The Mumford-Shah model is an important variational image segmentation model. A popular multiphase level set approach, the Chan-Vese model [25, 30], was developed for this model by representing the phases by several overlapping level set functions. ChanVese approach involves geometric active contour model (based upon Mumford -Shah Functional). The model begins with a contour in the image plane defining an initial segmentation and then contour is evolved according to evolution equation. The basis of Chanvese algorithm is a Fitting Energy Functional [26, 28]. The goal of algorithm is to minimize this fitting energy for a given image and corresponding will define segmentation.

For any given image u_0 a decomposition Ω_i of Ω and an optimal piecewise smooth approximation u of u_0 such that u varies smoothly within each Ω_1 and rapidly or discontinuously across the boundaries of Ω_i

To solve this problem, Mumford and Shah (1989) proposed the following minimization problem;

$$\inf\left\{F^{MS}(u,C) = \int_{\Omega}(u-u_0)^2 dxdy + \mu\int_{\Omega\setminus C}|\nabla u|^2\, dxxy + v|C|\right\}$$

A reduced case of the model is obtained by restricting the segmented image u to piecewise constant function, i.e. $u = \text{constant } c_i$

Inside each connected component Ω_i.This problem is called “Minimal Partition problem” and its functional is

$$E^{MS}(u,C) = \sum_i \int_{\Omega} (u - c_i)^2 \, dxdy + v|C|$$

It is easy to see that, for a fixed $\mathbb{C}$, the energy from above is minimized in the variables c_i by setting

$$c_i = \text{mean}(u_0) \text{in} \Omega_i$$

3.2.1 Levelset curve formulation [Lipschitz function]:Ω→R

The Levelset curve evolution is explained in [29],

$$C = \{(x,y) | \Phi(x,y) = 0\}$$

$$\begin{cases} C = \partial\omega = \{(x,y)\} \epsilon \Omega : \Phi(x,y) = 0\} \\ \text{inside}(c_1) = \omega = \{(x,y) \epsilon \Omega : \Phi(x,y) > 0\} \\ \text{outside}(c_2) = \omega = \{(x,y) \epsilon \Omega : \Phi(x,y) < 0\} \end{cases}$$

Thus

$$F(c_1, c_2, C) = \int_{\Omega_1 = \omega} (u_0(x,y) - c_1)^2 H(\Phi) dxdy + \int_{\Omega_1 = \Omega - \omega} (u_0(x,y) - c_2)^2 (1 - H(\Phi)) dxdy + v \int_{\Omega} |\nabla H(\Phi)|$$

Where $H(.)$ is Heaviside function and $u_0(x,y)$ is the input image. This minimization problem is solved by taking the Euler-Lagrange equations and updating the level set.

In order to reach the minimum of F, we find the derivatives of F and set them to zero

From Euler-lagrange equation we therefore update c_1 and c_2 and Φ recursively.

$$\begin{cases} c_1(\Phi) = \dfrac{\int_{\Omega} (u_0(x,y) H(\Phi(t,x,y)) dxdy}{\int_{\Omega} H(\Phi(t,x,y)) dxdy} \\ c_2(\Phi) = \dfrac{\int_{\Omega} (u_0(x,y)(1 - H(\Phi(t,x,y))) dxdy}{\int_{\Omega} (1 - H(\Phi(t,x,y))) dxdy} \end{cases}$$

$$\frac{\partial \Phi}{\partial t} = \delta(\Phi)[v \text{div}(\frac{\nabla \Phi}{|\nabla \Phi|} - (u_0 - c_1)^2 - (u_0 - c_2)^2]$$

Where $\delta(.)$ is the Dirac function.

3.2.2 The Chanvese active contour without edges

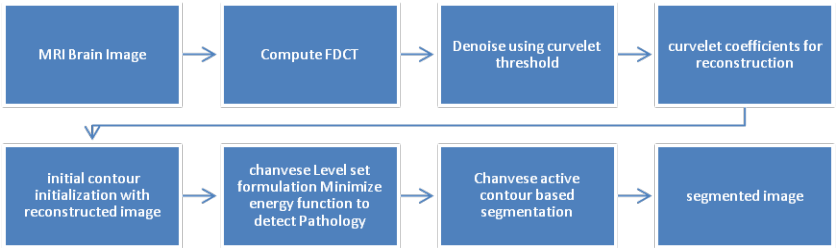
By the Mumford Functional for "Minimal partition problem" and by the given curve $C = \partial\omega$, with $\omega \subset \Omega$ an open subset, and two unknown constants c_1 and

c_2,denoting$\Omega_1 = \omega$,$\Omega_2 = \Omega - \omega$. Chanvese proposed to minimize the energy with respect to $c_1, c_2$and C

$$F(c_1, c_2, C) = \int_{\Omega_1=\omega} (u_0(x,y) - c_1)^2 dxdy + \int_{\Omega_1=\Omega-\omega} (u_0(x,y) - c_2)^2 dxdy + v|C|$$

to detect objects in a given image based on techniques of curve evolution, Mumford–Shah functional for segmentation and level sets.

3.3 8. Our Proposed method



To extract the desired regions of interest [ROI], the proposed algorithm operates by decomposing the enhanced image into different frequency bands. The Fast Discrete Curvelet Transform (FDCT) is applied this allows a sparse representation of objects in an image. With proper threshold, Curvelet denoising is performed on the image. The image is then reconstructed with curvelet coefficients after threshold and denoising. Thus this reconstructed Curvelet output image is used to initialize the Chanvese region based active contour model. We used the two phases and multiphase Chanvese active contour model that utilizes the global mean intensities of the interior and exterior regions of images, and provide good segmentation for the objects with weak or discrete boundaries.

4 Results

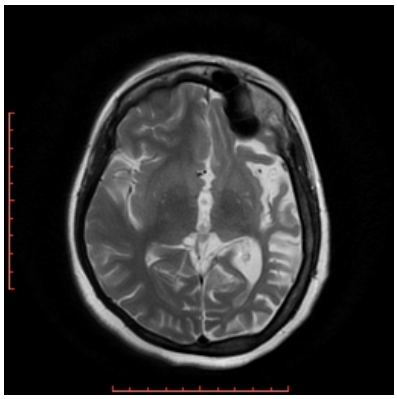


Fig 4.1) Brain MRI Image

Fig 4.2) Curvelet denoised and fused output image

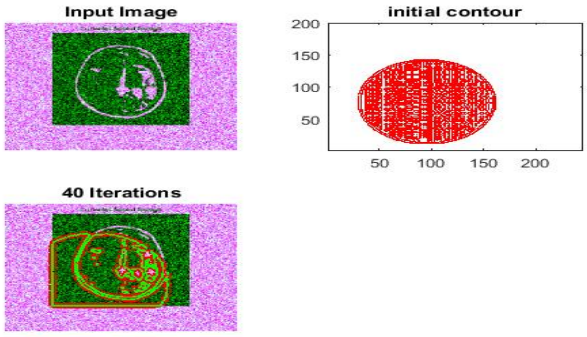


Fig 4.3) Chanvese active contour segmentation initialized with Curvelet output

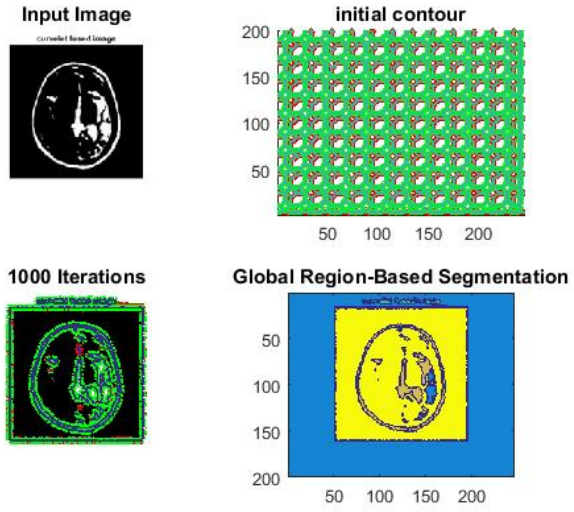


Fig 4.4) Integrated Multiscale and region based segmentation output.

Fig 4.1 shows the MRI image of human brain, which is then, analyzed using multiscale and multiresolution strategies using Curvelet transform. The Curvelet coefficients with suitable thresholding are reconstructed and denoised to produce the output image in **Fig 4.2**. The output image in **Fig 4.2** is then initialized and segmented using Chanvese active contour in two phases, with noise removal at intermediate stages **Fig 4.3**. Finally we get the segmented output as shown **Fig 4.4** which shows the Pathological region highlighted in bluish patch, the segmented output.

5 Discussion and Conclusion

Application of Multiscale methods with Active contour model for image segmentation is an active research area. In this paper a combination of Multiscale Curvelet transform and Chanvese region based active contour is proposed for detecting the desired ROI from MRI Brain Images. The Curvelet transform is a multi scale transform with better directional sensitivity .It helps to extract the image detail at various scales and directions according to the features of interest to be extracted. Integrating a multiscale , multiresolution transform such as Curvelet transform with Active contour models can effectively and intuitively solve those problems of Noise inhomogenity [13].The proposed Multiscale active contour

segmentation model uses the entire scale space, to introduce the geometry of multiscale images in the segmentation process. The extracted multiscale structures will efficiently improve the robustness and the performance of standard shape analysis segmentation techniques such as shape recognition and shape registration and is able to extract convex and concave object based on coarse-to-fine scale and small-to-big size strategies. The active contour models cost less expensive for computation because the rough segmentation results of the coarse scale maps can be taken as the initial contour scale map. The multi-resolution strategy is more robust to reduce the effect caused by noise. The segmented images show improved accuracy and precision. Further the research is open to implement other variational levelset Active contours for efficient segmentation.

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