

The Use of Robots in Indonesia

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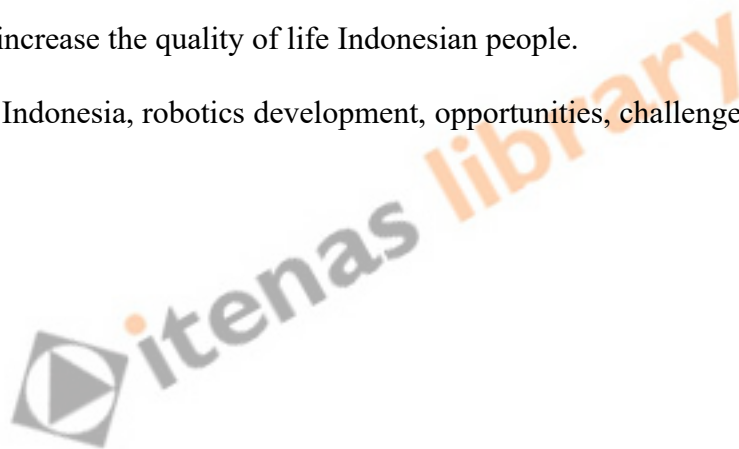
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### Abstract

This paper describes the development of robotics in Indonesia including the use of it in several aspects and ways to make Indonesian people be accustomed with robotics, such as researches, contests, trainings, and robots selling. There are also many opportunities to develop many applications of robotics based on Indonesia's topology, problems, and needs, such as surveillance robotics to survey its environment, weather, conditions after accidents or disasters; intelligent vehicles to connect inter-islands; military robotics such as spying robots to against terrorists or robots for defusing bombs; or rehabilitation robotics in biomedic applications. On the other hand, the development faces several challenges related to Indonesian cultures. But, it becomes a way to increase the quality of life Indonesian people.

*Keywords:* Indonesia, robotics development, opportunities, challenges



## Bio

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### The Use of Robots in Indonesia

Republic of Indonesia is one of developing country in Asia. It is an archipelago country with 17,508 islands and has over than 238 million populations. This country has various different cultures which evolves from hundreds years of absorption processes.

The large number of islands and the wide-scale of seas and oceans surrounded this country become a challenge to solve in connecting inter-islands, related to the economy flow and migration of its people. Various terrains of its islands are a dare to overcome when surveying have to do. It also has high potencial of natural disasters such as earthquakes, volcano eruptions, tsunamis, floods, landslides, forest fires, windstorms, and also health disasters. All of those problems mean that technology is required to support the increasing of quality of life of Indonesian people, help reducing the number of victims both real victims and SAR team members when a natural disaster happens.

Meanwhile, the nation's cultural values influence Indonesian people life. Its motto of *Bhinneka Tunggal Ika* adopted from Sanskrit, means Unity in Diversity, makes Indonesian people always learn to accept and tolerate differences between themselves. Learning and developing the proper democratic system are always being done by its entire stratum. However, Indonesia is also influenced by world situations. Terrorism is being one big problem to solve. It intimidates the comfort, serenity, safety, and trust value of Indonesian people life. It spreads the fear in community. It also endangers humans' life. Many efforts are being implemented to oppose terrorism. Here, technology is also required to support those efforts and reduce the amount of victims.

Therefore, some rehabilitation applications in medical field are required related to some cases. The number of stroke patients increases and they need autonomous rehabilitations after

allowed to go home. Prosthetic limbs embedded by robotics technology are also considered to increase the quality of life the disabled people, or the amputated legs or arms of victims of accidents and natural disasters.

At the moment, many Indonesian academics and researchers realize that robotics technology can be used to solve several problems mentioned above and support to increase the quality of life Indonesian people, or in other words, to more humanize Indonesian humans.

### **The Development of Robotics in Indonesia**

There is no exact date of when robotics was started to develop in Indonesia. But, in the 1980's, several academics who were back to Indonesia after studying in Japan and Europe start to build a research of robotics in their institutions. They are faculties of Mechanical Engineering and Electrical Engineering departments of their universities.

Then, in early 1990's an institution held an internal contest to grow the research spirit of students and the winner was sent to ABU Robocon. In 1993 the contest became a national level supported by the Ministry of Education. Later in 2001, the delegation won. This annual contest evolved, had several themes in 2004 based on the reason that the intelligence should be embedded to a robot. A contest to collaborate technology and art was also initiated and held annually.

Annual contests are not only held by the Ministry of Education, but also by some institutions. To make robotics popular, a university holds a line following robot contest annually. This contest is held not only for college students, but also high school students. Later, many competitions are organized, and contestants are open for kids to college students.

Here, robotics widely used in industry, especially in manufacture to fulfill preciseness and speed of production. Besides, the other users are academics to keep the state of the art the robotics researches, and researchers of government institution including military for special purposes. Recently, the use for domestics starts to be applied, such as vacuum cleaner robots.

Several years ago, academic institutions experienced a difficulty in getting components of robots. Lecturers and students could only utilize, configure, and manipulate available components that sold in electronics stores, although those components do not have good quality. Several academics asked their colleagues to buy good components when they go abroad. Other way, they ordered to stores abroad with a risk of higher price because of shipping costs and high entry taxes. In the last several years there are some components stores which provide the better components, so academics have more opportunities to develop robotics.

Because the interest of robotics increases day by day, some companies are established which business is training of robotics. They open training classes for students of primary and high school, also for university students. Academics also give some training to several primary and high school to socialize robotics and to communicate with people outside universities.

The development of robotics in Indonesia becomes wide. Therefore, a formal association is required to manage, help, and monitor the development, and to communicate all of roboticists in Indonesia. In June 2010, several academics and team of national contest jury proposed to establish the IEEE Robotics and Automation Society Indonesia Section. Then this idea was driven by Muhammad Ary Murti, a lecturer of Telkom Institute of Technology (Institut Teknologi Telkom, ITT), Bandung. He asked our signatures as members of the IEEE Robotics and Automation Society to propose a petition of establishment to IEEE. In December 2010 the petition was sent to the IEEE, and it was approved. Finally, the IEEE Robotics and Automation

Society Indonesia Section formally established in February 19, 2011. We hope the establishment can support the developing of robotics in Indonesia with its challenges that should be overcome.

### **Robotics researches in Indonesia**

Actors of robotics researchers in Indonesia are academics, researchers of government institutions, and researchers of military. On average they are engineers, from electrical and mechanical engineering, computer scientists, and few of them are industrial designers. Medical and biomedical people are involved as consultants when roboticists are asked to design a robot related to medical applications, or when roboticists propose to build medical robotics. People from other fields have not been involved yet. Most of development cases are engineers' responsibility.

Academics build robots and try to adjust with state of the art the world robotics researches, try to build the better robots for their mechanics, control, intelligence, design, or application. Researchers of government institutions and military build robots for their and the republic requirements such as surveillance needs. But, the design aspect is usually adapted to the application requirement.

When researchers meet a case to design a robot, they notice what task the robot should do. Then they prescribe the basic idea of the robot and determine the robot's specifications. They choose what sensors should be used and the number of it, what kind of motion should be applied, what control algorithm should be implemented in the robot, and other technical specifications. On average, the design of robots only considers technical and engineering aspects, from mechanicals, electronics, and algorithms. A few of researchers involves industrial designers to make a robot with good ergonomic aspect, and to help designing from other point of view. They

have not thought about ethical aspect yet because robotics applications are still for technical things.

If we look the robotics research taxonomy of IEEE, there are still several area that built.

#### 1. Aerial Robotics

Several academics concern in developing Unmanned Aerial Vehicles (UAVs), and some of them collaborate with government institutions and military. There is a research group of Bandung Institute of Technology (Institut Teknologi Bandung, ITB) that concerns to this field, started from a hobby of several academics of aeromodeling. That hobby was developed, and now this research group helps National Institute of Aeronautics and Space (Lembaga Penerbangan dan Antariksa Nasional, LAPAN) and Indonesian military in building UAVs for surveillance.

#### 2. Agricultural Robotics

There is no development of agricultural yet although some researchers have many ideas to help farmers.

#### 3. Biorobotics

The development of biorobotics is still in legged robotics, trying to imitate the motion of spider or similar other arthropodas. But, the cognitive ability of animals is developed to make the intelligence aspect of robots.

#### 4. Computer and Robot Vision

There are many researches of computer and robot vision. Image processing and recognition experiments are being done by not only roboticists, but also biomedical engineers, and they are cooperating in discussing the better methods of these researches. The use of robot vision becomes wide for the current time. More robots require vision as



their complete sensing. Many applications of robotics need vision to accelerate flow of information and facilitate decision-making.

#### 5. Humanoid Robotics

Many academics build humanoid robots in small scale, approximately like NAO-Aldebaran size, to join the soccer robot contest. Some academics start to explore humanoid robots, how to control, how to embed the intelligence, and how to build many applications of them beside soccer or dance robots.

#### 6. Human-Robot Interface and Coordination

Interaction of humans and robots in Indonesia are still “semi-social”. Researchers are certainly as mechanics, programmers, designers, and operators. There is still no teammate relationship between humans and robots. But, plans to reach it are proposed by many researchers.

#### 7. Intelligent Transportation Systems

There are some researches of intelligent vehicles although in the scale of engineering model. They develop methods of navigation aspects. There is still no prototype or the real implementation of intelligent transportation systems, although Indonesia needs many of this application for mass transportation.

#### 8. Micro/Nano Robotics

The research of micro/nano robotics is not being done at this time.

#### 9. Networked Robotics

This research is in line with surveillance robotics application to get the captured information or control the robot from afar.

#### 10. Programming Environment in Robotics

This field of research is being done by many academics to design robots' environment, design the robots' architecture, and simulate the control systems.

#### 11. Prototyping for Robotics

For the moment, prototyping for robotics is limited for contest requirement, not for mass production.

#### 12. Rehabilitation Robotics

Some research groups start to build rehabilitation robots, they cooperate with biomedical engineering. They are building musculoskeletal therapy applications, and a little of them is starting to build neurological therapy applications.

#### 13. Robo-Ethics

There is no special research of robo-ethics. It is only informal conversation between Indonesian roboticists about the ethics side of some robotics applications. But, they more concentrate on technical problems of robotics.

#### 14. Safety Security and Rescue Robots

These applications are widely developed now in Indonesia, such as surveillance robotics and contest of fire-fighting robots. Some of researchers had built engineering models of patrol robots, and also rescue robots for natural disasters.

#### 15. Service Robots

Research of this field more concentrates on vacuum cleaning robots, although some of them start to develop other service robots using Sony Aibo as pet robots.

#### 16. Surgical Robotics

There is no development of surgical robots.

#### 17. Underwater Robotics

Although Indonesia is surrounded by seas and oceans, there are only a few of researchers who concern on this field.

### **Robot contests in Indonesia**

The first robot contest in Indonesia was held in 1990 by Electronics Engineering Polytechnic Institute of Surabaya (EEPIS) as internal contest. The winner of this contest was participated to NHK Robocon in Tokyo, Japan. Then in 1993, the Ministry of Education supported by TVRI, the government television station, as the member of ABU (Asia-Pacific Broadcasting Union), held the contest and made it to be a national contest. This contest, named as KRI (Kontes Robot Indonesia) or Indonesia Robot Contest (IRC) aims to select the delegation to compete in ABU Robocon. It is the contest for college students, means only diploma or bachelor students of polytechnics or universities could join in. Nonetheless, their lecturers have to accompany students in competition.

Because of choosing the delegation for ABU Robocon, all of the rules of KRI refer to ABU Robocon rules. It follows that because ABU Robocon is annual competition, KRI is also held annually. After participated for eleven years, finally Indonesia team won in the 2001 ABU Robocon that was run in Koriyama, Fukushima-Japan. This team was represented by B-CAK team from PENS (Electronics Engineering Polytechnic Institute of Surabaya – EEPIS).

The theme and rules of KRI and ABU Robocon are different year by year. For 2011, the theme is “Loy Krathong, Lighting Happiness with Friendship”, which was held in Bangkok, Thailand on August 28<sup>th</sup>, 2011. The final task of robots was dropping Candle Light Flame on top of Candle. Contestants of KRI and ABU Robocon have to build two kinds of robots, manual and

automatic robots. The number of manual robot is usually one robot, and automatic robot can be more than one robot.



Figure 1 KRI arena



Figure 2 Final 2011 contest

All of robot contests that organized by the Indonesia Ministry of Education purpose:

1. To grow and increase the creativity of students in university
2. To apply science and technology in real world
3. To increase the sensitivity of students in developing robotics technology field
4. To develop competitiveness in higher educational environment

For the Indonesia Robot Contest, there is one more purpose; it is to determine delegation in ABU Robocon.

In 2003, there was an issue to make a similar contest, but artificial intelligence must be embedded in the robot to increase the robot quality, especially in control system. To implement this, in 2004 the Indonesia Intelligent Robot Contest (Kontes Robot Cerdas Indonesia – KRCI) was started. Theme and rules of this contest are adopted from the Intelligent Fire-Fighting Robot Contest in Trinity College, Hartford, Connecticut USA.

When started, there were two categories of competition in KRCI, senior and expert divisions. In senior, it was only bachelor students and their advisors who could join. In expert division, it was opened for bachelor, master or doctoral students or companies. Meanwhile, the increasing number of participants of universities make this competition is limited only for bachelor students now.

Senior division is divided to two divisions, wheeled and legged robots. Wheeled and legged senior divisions are always run every year, and the difficulty level is more increased. This year, the system of competition was semi-battle. Two teams were confronted parallel on two separated mazes. The team which could finish the task faster than another was the winner. The national winners of these divisions were sent to the Trinity College Fire-Fighting Robot Contest as Indonesia's delegations. This year, Indonesia's teams won in senior wheeled and walking robot divisions of Trinity College Fire-Fighting Robot Contest. The representative teams from Universitas Gadjah Mada (Gadjah Mada University, UGM) became the winner and runner up of senior wheeled division, and teams from Institut Teknologi Bandung (Bandung Institute of Technology, ITB) became the winner and runner up of walking robot division. All of teams that sent to Trinity College were the winner of KRCI 2010. Moreover, there were other teams also

that were represented their own university, Universitas Komputer Indonesia (Indonesian Computer University, Unikom). They joined standard and advanced divisions of Trinity College RoboWaiter Competition and became the winners of them.



Figure 3 Maze of fire-fighting robot in KRCI

From 2004 to 2009 the expert division was the fire-fighting robot contest with two floors maze. In 2010 the division was deleted, it was changed to battle division. In this division the contest adopted soccer robot. Image processing and battle for grabbing balls had to be done by each team. In 2011, the theme of battle robot is similar, intelligent soccer robot, but there was no wheeled robot. All of teams must use bipedal robot in fighting for the goal.



Figure 4 Battle division of KRCI

Since 2009, to increase the sensitivity of students in nation arts and cultures, there was a Kontes Robot Seni Indonesia (Indonesia Art Robot Contest, KRSI). All of participants had to make robots which could dance Jaipong, a traditional dance from West Java. In 2010, the theme was changed. Participants had to show Pendet Dancer robots. Pendet is a traditional dance from Bali. And then this year, Klono Topeng robot had to build and compete in this contest. Other goal of this contest is to conserve the diversity of Indonesian cultures.



Figure 5 Jaipong dancer robot



Figure 6 Pendet dancer robot



Figure 7 The winner of KRSI 2011

Besides the contest that is organized by the Ministry of Education, there are also several contests for students. One of them is organized by ITB. It is Galelobot, an annual competition of



line-following robots. This is not only for college students, but also for high school students. Other competitions are also held by several companies for elementary and high school students, but they are not organized annually.

For this year, Indonesia is being the organizer of International Robot Olympiad (IRO) 2011 on December at Tarumanegara University (Universitas Tarumanegara – Untar) and STKIP Surya. It is an annual competition for primary and high school students around the world. This year competition theme is “Robot That Can Help People from Natural Disaster”.

As mentioned before, contests are held to prepare students in applying science and technology in real world. It also can be a preparation when they graduate and work in industry. As far, competitions in Indonesia have no conflict with law, morality and ethics like Asimov’s Law, or morality in design. But, roboticists in Indonesia will face this roboethics issues as soon as applications, infrastructure, and the readiness of our students, academics, and other researchers in the further development of robotics, especially when it starts to build service robotics.

### **Robotics use in Indonesia**

There are several parties who use robotics in Indonesia for this time, they are:

1. Academics

Academics use robots for research need, for continuing the state of the art robotics research. From this party we can hope the outcome of brilliant ideas about robotics and its applications for increasing the quality of human life and humanizing humans.

2. Military

Military use robots for monitoring Indonesia, from the West to the East, monitoring its islands, seas, and air, and also monitoring borders of Indonesia with other countries.

### 3. Government institution

Government institutions that develop and use robotics are BPPT (Agency for the Assessment and Application of Technology, Indonesia), LAPAN (National Institute of Aeronautics and Space), and LIPI (Indonesian Institute of Sciences). Three of those institutions also cooperate with military and some universities in developing robotics. For non military use, they develop surveillance robotics to monitor the weather of Indonesia.

### 4. Company

Many manufacturing industries use robotics, in this case is manipulator, to produce their products. The most number of users are automotive, electronics, and mining industries. They use robotics for safety, preciseness, and fast production.

### 5. Domestic

Although there is not widely used, but vacuum cleaning robots have entered in domestic's area.

## **Selling of robotics in Indonesia**

In several years ago there was a difficulty to find robotics or components in Indonesia. Contests every year make robotics popular not only in academics and researchers, but also Indonesian people widely. This encourages many providers to sell robotics components in several cities in Indonesia. Of course this selling helps roboticists to get components easily with lower price enough.

Beside for research and contest requirement, there is a selling of domestic applications such as vacuum cleaning robots. Perhaps in next several years domestic appliances robots will be widely sold.

### **Training of robotics in Indonesia**

As the increasing of robotics popularity, many companies offer robotics training for primary and high school students, and also universities students. They give packets of training from basic to advance, how to assemble and program robots. But now, there is a company named Rumah Robot Indonesia (Robots House of Indonesia) that offers the training for lecturers too. It is because it provides many NAO-Aldebaran robots and others that not provided in universities. Of course it is a pleasant progress of robotics development in Indonesia.

### **Needs of Robotics Use in Indonesia**

There are some needs of robotics to use in Indonesia, such as for surveillance, rescue, and service robots. Actually, there are many applications that should be implemented for surveillance requirements in Indonesia. To see the country conditions such as Indonesia borders is one example. Other applications are to check the weather, check the river condition, to survey for mining, and survey after accident or natural disaster.

Some time ago there were UAVs built by ITB researchers for checking the condition of Citarum River, the longest river on West Java that dammed at three points, Saguling, Cirata, and Jatiluhur as hydroelectric powerplants, which provide the electricity of Java and Bali islands. Because of its pollution, several related parties built UAVs to check its condition, such as the water condition, the height of water, the amount of pollutant, and so on. In its development, the

building was stopped when some UAVs fell into the river. It was because the model of UAVs is helicopter, that perceived rather unstable when flew on the river. Now, there is a development of UAVs using quadrotor model, but it has not been launched yet until the required stability reached.

However, there is exciting news that BPPT and LAPAN build surveillance and reconnaissance UAV named PUNA, Gagak, and Pelatuk.



Fig 8 PUNA



Fig 9 Gagak

 itenas library



Fig 10 Pelatuk

The terrain of Indonesia is varied. The amount of mountains, rivers, islands, and its seas surrounded its islands become a challenge. The robot application for surveying the land related to agriculture and mining starts to be required. It is regarding to the safety of human in surveying.

Many islands means there should be many inter-island transportation modes. Robotics technology related to intelligent transportation system is more required now to make the quality of life Indonesian people better. It is needed to accelerate economic flows inter-island.

What about accident? There was a horrible aircraft accident on January 1, 2007. A Boeing 737-400 of Adam Air crashed into the ocean off the island of Sulawesi, Indonesia. This

accident killed all aircraft crews and passengers. Until now, they are not found. SAR team searched them, but some time they had to stop the searching because of the bad weather. For this case, UAVs or AUVs could be a help for SAR team.

Moreover, robotics technology is also required for after natural disaster surveying. Volcanic eruption, earthquake, and tsunami usually happen in Indonesia. Searching for the victims using robots are needed to not add the number of victims from SAR team. Robots that can enter the difficult and dangerous area are required to decrease the loss of life. This idea of making SAR robot has been proposed several years ago after tsunami in Aceh or earthquake in Yogyakarta.

When earthquake in Yogyakarta happened, buildings were crash and fell on many people. Actually, many of them were safe under the collapse buildings. But, they died because the way of rescue made them recessive by ruins. SAR team did not know whether or not victims still alive. The most rescue team do is trying to lift ruins with a difficulty to not drop ruins. With robotics applications, we could know the still-life victims under the crash building and try to safe them first rather than died victims. This gives the increasing of quality of life of natural disaster victims. It help to reduce the loss life of victims.

The application of robotics in military in Indonesia is for the requirements of Indonesia borders surveillance using UAVs and for spying in catching terrorists. Several prototypes of UAVs for surveying have been made by government institutions and military.

Moreover, the use of military robots exposed when antiterrorist squad, Densus 88, used two robots, MOROLIPs, in spying terrorists in Temanggung, Central Java, Indonesia, on August 9<sup>th</sup>, 2009. They help the squad in raiding terrorist without make injury or loss life the squad member or people.



Fig 11 MOROLIPI

Although MOROLIPIs could spy, they could not defuse the bomb. This ability will be added to overcome bomb threats and attacks in Indonesia. The number of bomb threats is rising as the increasing number of terrorists. One threat of book bomb brought several injured victims on March 15<sup>th</sup>, 2011. Police officers who tried to defuse the bomb manually got wound on their heads and arms.

Service robotics applications are also required especially in medical applications and some for domestics' appliances. Rehabilitation applications are the prospectus thing to develop. Stroke patients need an autonomous therapy after they are allowed to go home. Doctor visits or health checking to hospitals can not do all of the time. They are done periodically. Meanwhile, not all of family members or the nurse can assist patients all of the time. Patients have to train themselves, such as make move their legs, or hands, or arms, to make active their motoric back. Applications of self-training for rehabilitation based on robotics technology can be proposed and implemented to solve this problem.



Musculoskeletal applications also can help to train stroke patients or disabled people in returning their motoric functions. An exoskeleton robotics can be used to help disabled people have normal activity in their life independently.

The development of prosthetic limbs can increase the quality of life of amputated people. They who do not have arm(s) or hand(s) or leg(s) is certainly supported to do many activities using prosthetic limbs.

Those are only a few of examples of the robotics application opportunities in Indonesia related to the effort to increase the quality of human life. Other applications such as biorobotics, computer and robot vision, humanoid robotics, human-robot interface and coordination, underwater robotics, and robo-ethics can support the main requirements of robotics using in Indonesia.

### **Challenges**

Admittedly, Indonesia has diversity in cultures, religions, and ethnics. When robotics starts to take off to higher application levels, we must be ready to not conflict with moral and ethics aspects of cultures, religions, and ethnics. This is a big challenge to us, when multidisciplines here have not been bridged properly yet.

There are several religions that are believed by Indonesian people, they are Islam, Protestantism, Roman Catholicism, Hinduism, Buddhism, and Confucianism. The developing of terrorism in the world affects Indonesia. Some radical groups that behalf radical Muslim groups terrorrize people and the serenity of people life with bomb attacks. It becomes a challenge to solve to guarantee the people safety with an application of technology, in other words the application of robotics.

Therefore, many cultures and ethnics of Indonesian people means that a thing can suit to one culture, but it can not be appropriate to others. For the extreme example, some traditional tribes still forbide the electricity to interfere their life, but most of tribes can accept lighting and electronics appliances. It is a challenge when we want to build a system that can be accepted globally.

The less understanding of technology also becomes a barrier to build robotics, but it is a challenge to build the most user-friendly robotics that make all of people can use robots without any difficulty or failure that cause the damage of robots. On the contrary, people put a high expectation that robot can do everything they want. They are very enthusiastic when hear the word “robot”. Sometimes they feel disappointed when robot can not do something what they ask. When you are in the middle of contest, you may feel the pressure that experienced by contestants because viewers sometimes scoff their robots when they can not move, or move wildly on the arena, or wrong in reading the object.

Some of people are also only follow the trend without understand the aim of the technology. This make sometimes technology does not develop in right thing. This is a challenge for trainer to give the right understanding to the trainee, introducing the technology and also the utility.

Service robotics is the field that will be opposed in developing. For example, when build a robot to assist the elderly, you will experience some refusals. A robot to assist the elderly walking around will be told that his or her child or grandchild is impolite to the parent or grandparent, does not have a sense of caring, overbold to let the elderly walk around with a robot. Other case is a robot to assist the daily life of the elderly. You will be scolded the similar things. Even commending your parents to nursing homes are still a negative behavior according

to the majority of public opinion. On the average, Indonesian culture teaches its people to devote to their parents. One form of the devotion is caring your parents by yourself, or asking them to live together in your home, or visiting them frequently to their house and making sure they are cared by your trusted relative. But, do not even send them to the nursing house. Those problems are a challenge to propose the proper, safe, and comfort robotics technology to care the elderly, to care our parents very well.

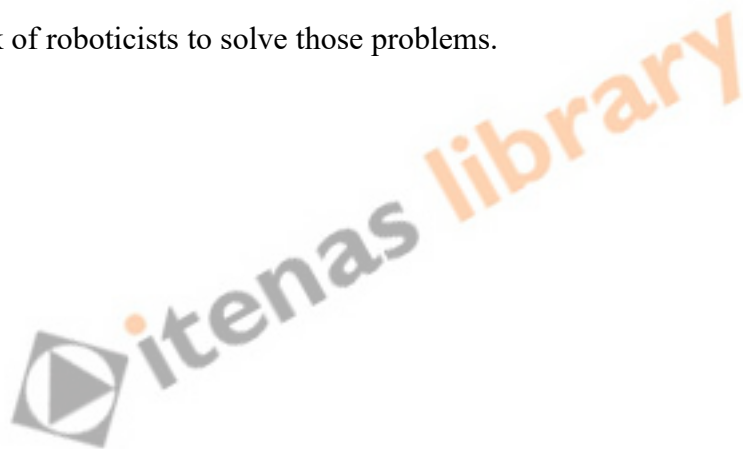
The application of sex robots surely will be strongly opposed. The religious value in Indonesian culture forbids someone to have sex with his or her legitimate spouse. Pornographic is also a taboo thing. So, sex robot is not appropriate with dogma of religion in Indonesia.

The last challenge is the research cost. We all know that robotics researches and developments can swallow a lot of cost. The research fund of universities is limited, and it has to be distributed to many fields of study. Meanwhile, the collaboration between universities and industry has not run good like in Japan or Germany and the collaboration of military or government institutions is only between several universities. Furthermore, the research fund from the government is not large enough. This becomes a big problem for almost of universities in Indonesia. The development of robotics is hampered by this problem and also the regulation of the government. Therefore, this is a big challenge to solve by all of roboticists in Indonesia.

### **Conclusion**

After explanation of the robotics development in Indonesia with its requirements and challenges, there are several conclusions that robotics development here is still in preparation to make robot applied widely, fulfill the requirement of Indonesian people and culture. The aims of robotics development here proposed by roboticists, in this case engineers, are to help people in

many sectors, to reduce the risk of injury and loss life, and to increase the quality of life. At the moment, there is no conflict of robotics with ethics and moral. There are many required things of surveillance applications of robotics, to increase the quality of life Indonesian people related to its terrain and topology. Robotics technology for surveillance is to humanize the human in their life. The military robotics development does not conflict with the disallowance to harm or injure human, but to save more. There are also a need of rehabilitation and assisting robots in medical applications for help patients and the elderly. But when the development become deeper and wider, ethics and moral aspects related to cultures, religions, and ethnics will become the big challenge to think and solve. In short, many challenges happen related to many aspects and become homework of roboticists to solve those problems.



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