Lextor: A Connected System where Robots Talk

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Our planet is currently wrapped under several issues that have the potential of giving rise to severe consequences. Starting from the very basic issue that most of the working class gets to be a part of everyday- the poorly regulated **traffic.** Can you imagine being struck in a 62-mile long traffic that lasts for days? This is what happened in 2010, on the Beijing-Tibet Expressways. Added to this are the accidents that happen way too frequently now due to this. If we only talk about India, one serious accident happens every minute, and 16 people lose their lives due to accidents every hour. [1] **Health** requires a lot of attention, and better **infrastructure** is prudent for that. 20% of the population *still* lacks access to modern electricity. Most of us already know the solution to this- renewable sources of **energy,** which in turn will also solve the **climate change** issues in several ways. [2] Careful management of *life on land and under water* is something not most of us talk about but requires equal attention.

On 25th September, 2015, countries adopted a new sustainable development agenda at an historic UN summit, which contained a set of 17 **UN Sustainable Development Goals** (UN SDGs), to tackle issues such as the ones mentioned above, aimed to be achieved by 2030. [3] It's about time that we make full use of technology to support these goals, which is why we came up with this project. Using **Artificial Intelligence (AI)**, we aim to fulfil many of these targets in a short time span, thus enabling an intersection of technology and sustainable development.

OBJECTIVES

- To provide a platform wherein users can avail multiple land, air or water facilities, such as surveillance and maintenance, to boost efficiency of their sectors, all using robots.

- To make available these services using latest technology- i.e., by a swarm of robots in air (swarm of drones), on land (swarm of land robots) or under water (swarm of aqua-robots), all controlled by an Artificial Intelligence.

- Through this, to make as many people and sectors as we can, ultimately a part of our broad vision goal to accomplish UN's Sustainable Development Goals before 2030.

- To provide a great connected healthcare to people

- A create a decentralized system in order to do tasks faster

- Provide a system for control and management of traffic using UAV

HIGH-LEVEL MATERIALS REQUIRED

1. **Robots**

The robots will be designed and pre-programmed by us, and therefore will operate autonomously in all the 3 domains- air, land and water. **Drones** (UAVs) will work in air, the **wheeled robots** will cover the land, and the **aqua robots** will be in action under waters.

2. **Sensors**

There will be built-in sensor technology in the robots to facilitate application possibilities.

3. **Software**

Microsoft Azure will be used to run algorithms to carry out various operations.

Raspberry pi will contain control software. Azure will help in data processing.

THE PROJECT APPROACH

A. Requirements for Identification.
- **Heat Sensors** to find and monitor temperature changes.
- **Doppler Radar/ Speed guns** for monitoring speed of vehicles.
- **Smoke sensors** to check on fire.
- **Distance sensors** to survey up a piece of land and detect anomalies.
- **Camera Feed** to get the images and videos to run the algorithms on.
- Light detection and Ranging (LIDAR) for navigation and to avoid collision
- GPS for determining position

B. Processing.
- **Data In**. The data is obtained by different sensors from the drone and passed on to Raspberry Pi.
- **Data Sorting.** The data is then sorted out and only relevant data is passed for use.
- **Raspberry Pi.** The Raspberry Pi is the nerves of the system. It is the place where every equipment is connected. We may run Windows IOT core or any Linux Distribution on it
- **Azure.** Azure acts like the brain, a place where all the data is processed. By using web apps everything we intend to do will be achieved.

C. Azure.
- By using Azure, we will be able to provide lots of data in less time. A live footage will also be shown on our website to the controller if required.
- Azure will also add Artificial Intelligence to the drone, and the drone itself will learn how to act by using different algorithms.

MAIN STEPS

1. Identification

The robots will be designed to work over an area and identify everything it can using a camera mounted on it.

2. Processing

A Raspberry Pi Pocket Sized PC along with Windows IOT Core/Linux Distro will be used for sending the images to the Cloud and running algorithms

3. Cloud

Azure will be used along with many Open Source libraries to run different algorithms.

4. Algorithms

The algorithms azure will be running will be license plate recognition system, face recognition system, speed detection, fire detection, etc.

5. Output

The robots will be equipped to perform several tasks like informing nearby medical support or changing traffic lights, etc.

DESIGN OF THE ROBOTS

- **Swarm Intelligence:** The robots are designed by keeping **nature** in mind, hence we would be designing a **swarm of robots** in all three cases- the wheeled, drones and the aqua robots. There would be division of labour between the different robots, the way it is observed amongst queen bees and worker bees. The queen would give the commands and the workers would follow accordingly.

- **Artificial Neural Network:** We would be employing Artificial Neural Network (ANN) to improve the efficiency of our services. This system is based on the working of the human brain, wherein billions of neurons are connected via axons, and the dendrites accept stimuli and input from the environment. Hence, the similar concept can be replicated by the use of silicon and wires for the purpose of system identification and control

MONITORING AND EVALUATION

Monitoring and evaluation is done by various algorithms that provide easy functionality of the system, like the examples below. Azure is the cloud platform we used in order to deploy our code.

- **Speed and accidents**. Various sensors shall be used so that the drone detects speed of the vehicles and also find places where accidents can occur or have occurred.

- **License Plate Recognition**. By using OpenALPR, the drone will be able to identify any license plate, making it very easy to detect the owner of the vehicle involved in accidents or any illegal activity.

- **Facial Recognition**. OpenCV and Python Libraries will be used to detect faces which can be run in databases like Aadhar in India that stores face of every citizen.

- **Artificial Intelligence**. The received inputs need to be worked upon and since Humans cannot be always there to take actions we will need an artificial intelligence that takes specific actions on the basis of received inputs.

DELIVERABLES

UN SUSTAINABLE GOAL WE'RE TARGETING ON	THEIR GOAL TARGETS**	OUR SERVICES
Good health and well-being	• By 2020, halve the number of global deaths and injuries from road traffic accidents • Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all	• Traffic monitoring on roads (live footage, traffic lights controlling, surveillance etc.) and paramedic and telemedicine supplies in case of accidents. *[drones + wheeled robots]* • Automatic vaccination for cattle services *[wheeled robots]*
Affordable and clean energy	• By 2030, ensure universal access to affordable, reliable and modern energy services • By 2030, increase substantially the share of renewable energy in the global energy mix • By 2030, double the global rate of improvement in energy efficiency	• Surveys about energy hotspots *[drones]* • Monitoring installation of solar and windmills, etc *[drones+ wheeled robots]* • Solar and turbine inspection and maintenance (ex., cleaning of devices) *[drones + wheeled robots]* • Monitoring working of nuclear reactors to avoid nuclear catastrophes *[drones + wheeled robots]*
Decent work and economic growth	• Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors • Promote development-oriented policies that support productive activities, decent job creation.	• Traffic surveillance to check on illegal activities like human trafficking *[drones]* • Surveys and replacing certain difficult laborious tasks by robots for the mining sector *[drones + wheeled robots]* • Waste segregation and management based on image recognition *[wheeled robots]*

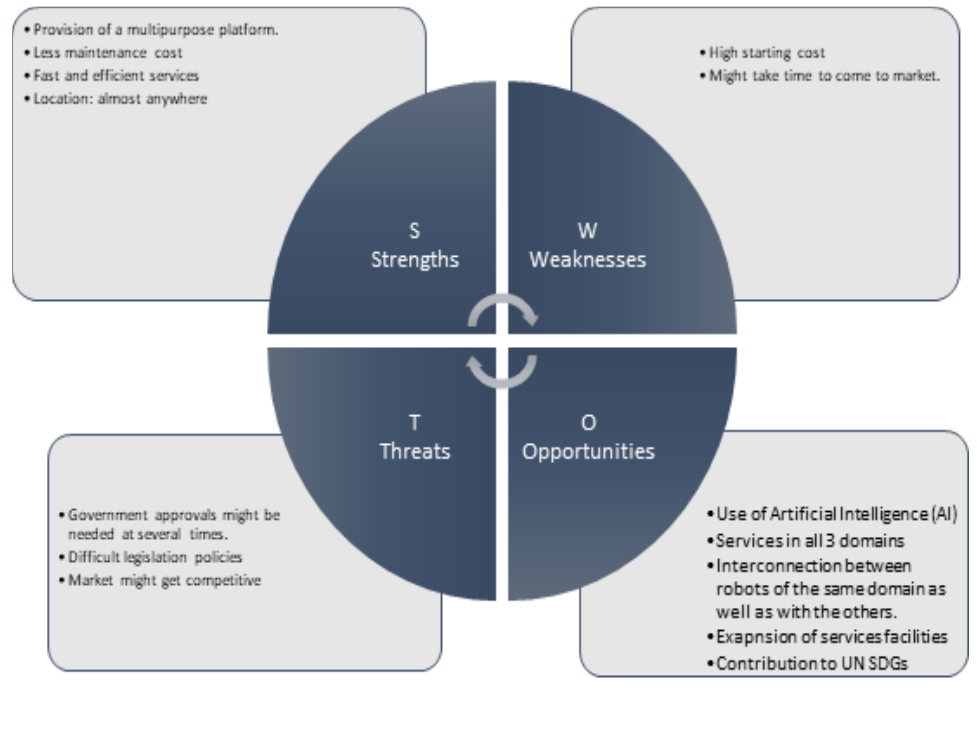|		
Industry, Innovation and Infrastructure	• By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes.	• Surveys for the construction sectors (land mapping, terrain, etc) *[drones + wheeled robots]* • Surveys for the insurance sectors (before and after damages, etc) *[drones + wheeled robots]* • Railway line monitoring *[drones]*
Climate action	• Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	• Research on topics like adjustment of gas levels in water bodies w.r.t. climate change *[drones + aqua robots]* • Quicker survey of air pollutants. Providing relevant data to airlines *[drones]*
Life below Water	• By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution • Increase scientific knowledge, develop research capacity about the same	• Underwater surveys *[drones + aqua robots]* • Managing oil spills *[drones + aqua robots]* • Checking contaminations underwater *[aqua robots]* • Oil pipes monitoring *[aqua robots]*
Life on land	• Take urgent action to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products • Mobilize significant resources from all sources and at all levels to finance sustainable flora/ agricultural management	• Surveillance in forest areas to check on illegal activities like deforestation and poaching. *[drones]* • Efficient drip irrigation agricultural facilities *[drones + wheeled robots]* • Quick survey and removal of weeds *[drones + wheeled robots]* • Surveys like forest cover, crops grown, yield, etc *[drones]* • Wildlife monitoring *[drones]*

Our Target Market:

Below is the list of organizations, groups or people that will be able to avail our services:

- Regular by-road travellers
- Social enthusiasts willing to contribute to UN SDGs
- Farmers
- Researchers in the field of energy and climate
- Healthcare sectors
- Real estate companies
- Insurance companies
- Meteorological Departments
- Solar and wind energy companies
- Mining sector
- Fishermen

Market Forecast:

According to forecast by *Tractica*, there will be a boom in the robotics market by 2022, and the revenue sales are expected to grow from $31 billion in 2016 to $237.3 billion by 2022. [6] Non-industrial robots will be enterprising this growth, which will positively affect sectors like consumer, enterprise, healthcare.

SWOT ANALYSIS

- Provision of a multipurpose platform.
- Less maintenance cost
- Fast and efficient services
- Location: almost anywhere

- High starting cost
- Might take time to come to market.

S Strengths

W Weaknesses

T Threats

O Opportunities

- Government approvals might be needed at several times.
- Difficult legislation policies
- Market might get competitive

- Use of Artificial Intelligence (AI)
- Services in all 3 domains
- Interconnection between robots of the same domain as well as with the others.
- Exapnsion of services facilities
- Contribution to UN SDGs

What makes Lextor worth the investment?

- **Multiple Possibilities. One Platform.**
  Many services can be carried out by this single platform, making it cost effective. The services are not limited to our current targets but can be expanded wherever required.

- **Latest Technology**
  Robots are the NOW main trend, and in our platform, they are controlled by Artificial Intelligence. The design of our platform is simple, as it is taken directly from the nature, hence allowing us to make our platform even more efficient with network designs like Artificial Neural Network (ANN) (design taken from the human brain).

- **Better World. Delivered.**
  With our platform, we assure that we will contribute to make this world a better place, and the consumers too will become a part of the process, as our broad vision goal is to work towards sustainable development by targeting on U.N. Sustainable Development Goals.

Market Trends

Robots represent a new and emerging market. It is pretty obvious that the robotics field will have a tremendous impact on the market in future. According to Business Wire *"The global robotics market reached a volume of 6.5 Million units in 2016, exhibiting a CAGR of around 25% during 2009-2016."* [4] Similarly, a boom in the robotics market is expected in the coming years."

To learn more about the current scenario of the market, we researched about 50 top robotics companies of the world [5] for fundamental view on topics like:

- Who's buying what types of robots
- For what uses are they being purchased
- What industries are the service-providers targeting
- Market location

We studied the websites of these robot companies to evaluate over these questions, *(***we have provided the names of the 50 companies and their website links in the reference section)* and the results are as follows:

Target market:

DISTRIBUTION

■US ■Japan ■Germany
■China ■Canada ■Denmark
■Switzerland ■India ■UK
■Estonia
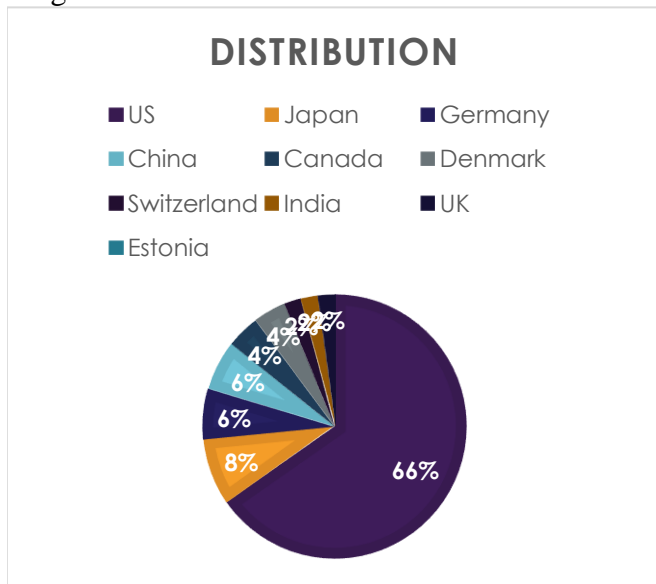
The data shows that the companies are majorly based in US. Asian countries like China, Japan and India are also a favourable hub for these companies. Hence, the North American market is currently the largest followed by the European and Asian markets at an almost equal level.

Target Industries: The following chart shows the industries that the current robot companies are targeting on:
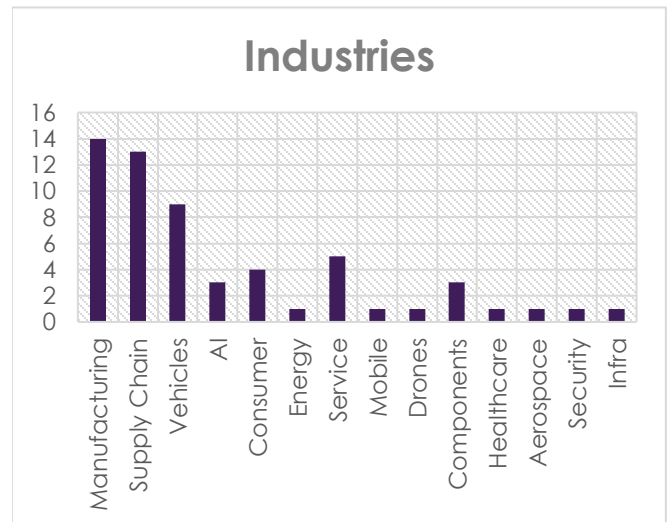
Industries

It's pretty clear that currently, majority of the robot companies are interested in the manufacturing and supply chain sectors, followed by vehicles and services industries.

Business Model

Key Partners

* Healthcare sectors
* Insurance companies
* Real estate companies
* Meteorological departments
* Solar and wind energy companies
* Banks
* Social Initiative partners (like UN organizations)
* Suppliers for materials

Key Metrics

* Traffic monitoring and medical supplies by drones during accidents.
* Survey and mining activities by drones and land robots.
* Surveys for infrastructure, construction and fishing sectors, by drones, land and aqua robots.
* Agricultural services by drones and land robots
* Surveillance and maintenance services for solar and wind energy companies by land robots and drones.

Key Resources

* Brand
* IT infrastructure
* Manufacturing unit
* Online platform

Unique Value Proposition

Our platform provides you with this unique platform wherein you can avail multiple land, air or water services, such as surveillance and maintenance, to boost the efficiency of your sector using robots controlled by Artificial Intelligence (AI).

By availing our services, you become a part of our goal at the broad vision level, which is to contribute to accomplishing the UN's Sustainable Development goals by 2030.

Advantage

* Through our platform, we'll be creating swarm of robots of each domain (air, land and water) and each swarm will be controlled by a master robot- 'Lextor' (AI).
* Our platform will be allowing 'interconnection' between the robots of the 3 domains' so that they work with coordination.
* Single platform will be able to contribute to UN's sustainable goals by AI in multiple ways.
* Will work autonomously.

Channels

* Website
* Products (drones, land robots, aqua robots)

Customer Segments

* Regular by-road travelers (who can avail healthcare services in case of accidents or natural disasters)
* Social enthusiasts willing to contribute to UN SDGs
* Farmers wanting to increase their agricultural yield.
* Fishermen hoping to improve their business
* People from various sectors wanting quick and accurate survey techniques.
* Researchers and workers in the field of climate change and energy.

Cost Structure

* Platform development (website)
* Production and distribution
* Marketing

Revenue Streams

* Service fees
* Donations from organizations

Note: The template design of the business model was taken from Xtensio (https://app.xtensio.com)

REFERENCES

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[2] Sustainable Development Goals: Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all. (http://www.un.org/sustainabledevelopment/energy/)

[3] Sustainable Development Goals (http://www.un.org/sustainabledevelopment/)

[4] Business Wire- Robotics Market: Global Industry Trends, Share, Size, Growth, Opportunity and Forecast 2017-2022 - Research and Markets (https://www.businesswire.com/news/home/20170530005555/en/Robotics-Market-Global-Industry-Trends-Share-Size)

[5] Meet the 2017 RBR50: Top 50 Robotics Companies (https://www.roboticsbusinessreview.com/wp-content/uploads/2017/03/RBR50_Whitepaper_vFF.pdf)

[6] Tractica: Robotics Market Forecasts (https://www.tractica.com/research/robotics-market-forecasts/)

*** Link: The 50 robotics companies we researched about: https://pastebin.com/1LRz6gWK