Shark Tracking for UML

Case Study Assignment

SEN 986

Spring 2014

Under Guidance of Professor Donna Dulo

Submitted By:

Shweta Verdia

Student ID: 84224

Table of Contents

Table of Figures

A. Shark Tagging - Use Case Diagram 1

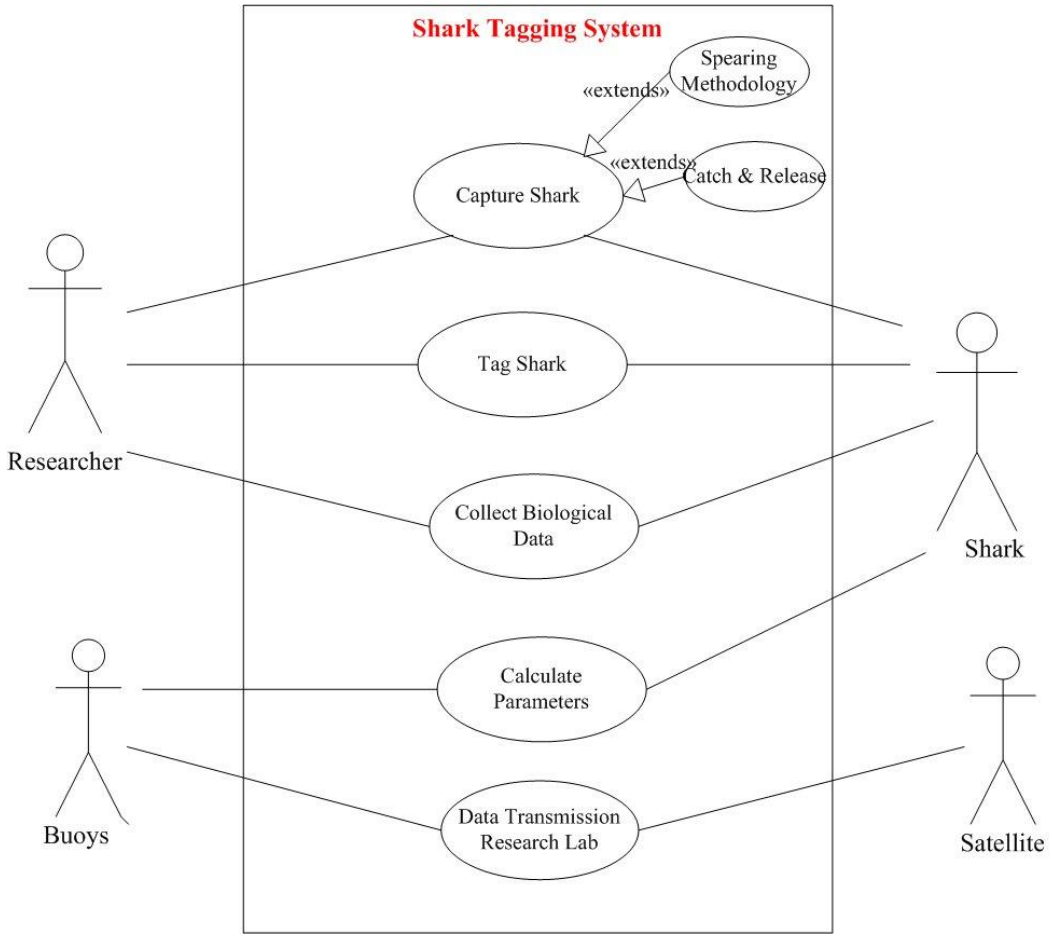


Figure 1 Shark Tagging Use Case Diagram 1

UC 1.1 – Capture Shark Use Case Description

Use Case ID	UC-1.1 Capture Shark
Use Case Name	Capture Shark in Shark Tagging Process
Use Case Summary	This use case describes the procedure followed for capturing a shark so that they can further be tagged. Capturing shark involves various methodologies which are described in this use case.
Actors	1. Primary Actor – Researcher

	2. Secondary Actor – Shark
Preconditions	1. Team tagging Shark should be expertise and experienced. 2. Tools and satellite tag to be inserted should be ready and tested beforehand for capturing Shark.
Flow of Events	1. Researcher and team is ready to capture shark. 2. The Research Team decides to capture Shark by Catch & Release method. 3. Team drifts themselves into the water with boat. 4. Also they attach bait into hooks to attract the shark, so that as it comes on the surface research team could catch shark fir tagging purpose. 5. They keep on spotting the shark the shark unless they could catch one. 6. As soon as they spot the shark they catch and attack it.
Alternate Flows	Alternate Flow 1 1. In step 2 of main flow of events if Researcher decided to catch shark by spearing methodology then Researcher then dives into the water to spot the shark. 2. Researcher keeps himself in water until he spots the shark. Keep on trying to check for shark in the water. 3. As soon as researcher spots the shark, he attacks on shark by spear gun from some distance to put the tag on its head.
Exception	1. If team is unable to spot the shark or attract shark then they would not be able to capture shark 2. Also if using spear gun, if not pointed with some distance and force then would not be able to capture shark.
Post Condition	1. Researcher able to capture shark.
Non-Functional Requirements	1. Shark should be captured and released in minimum time, while taken out of water. 2. Shark should be handled cautiously when they are out of water. And should remain live throughout the procedure.

UC 1.2 – Tag Shark Use Case Description

Use Case ID	UC-1.2 Tag Shark
Use Case Name	Tagging Shark in Shark Tagging Process
Use Case Summary	This use case describes the process to be followed while tagging a shark. It is very crucial stage in shark tagging process and for developing shark tracking system.
Actors	1. Primary Actor – Researcher 2. Secondary Actor – Shark
Preconditions	1. Team has already captured a shark and it should be ready for tagging. 2. Tools and satellite tag to be inserted should be ready and tested beforehand.
Flow of Events	1. Researcher check/ search for tag ID on the captured Shark to know that whether the shark that they have captured is already tagged or a new shark to be tagged for the first time. 2. Also researcher identifies the type of shark its breed then only the start the tagging process. 3. After identifying the shark type, researcher insert satellite tag on its dorsal fin of shark. 4. Then shark is released into water.
Alternate Flows	Alternate Flow 1 1. In step 1 above in main flow of events if Researcher founds a Tag Id on the fin of shark. Then it does not re-tag it. 2. Researcher starts recapturing Tag Id and other data to update in the system. Alternate Flow 2 1. In step 2 of main flow of events if unable to identify the type of shark, they do not tag it. 2. Researcher takes in the photos and video of the shark to study further on what kind of shark or sea animal it is.
Exception	1. If unable to identify shark, then they could not tag shark.
Post Condition	2. Researcher able to tag shark
Non-Functional Requirements	1. Shark tagging should be done in such a way that it should not impact its behavior or movement. It should remain healthy.

UC 1.3 – Collect Biological Data Use Case Description

Use Case ID	UC-1.3 Biological Data
Use Case Name	Shark Biological data Collection
Use Case Summary	This use case describes what all biological samples of shark are taken while they are tagged. Shark data collection helps researcher to for research and projects on sharks.
Actors	1. Primary Actor – Researcher 2. Secondary Actor – Shark
Preconditions	1. Team has already captured a shark and it should be ready for sample data. 2. Tools to be used for sample data collection should be ready and tested beforehand. 3. Sampling should be done by experienced team/ researcher.
Flow of Events	1. Researcher takes in the DNA sample of shark by biopsy i.e. taking a part of skin. 2. Also researcher then identifies the type of shark i.e. male shark or female shark and its species type. 3. Shark length and height is measured with the help of scale. This process in done simultaneously while shark tagging activity is going on. 4. Shark is then observed for its condition after taking samples and tagging and then finally released into water.
Exception	1. If shark is not tied and handled properly, biological data collection becomes impossible.
Post Condition	1. Researcher able to collect all the sample required for further analysis.
Non-Functional Requirements	1. Shark should be monitored continuously for its behavior. 2. Sample should be taking without hurting shark and they should be healthy when released into water.

UC 1.4 – Calculate Parameters Use Case Description

Use Case ID	UC-1.4 Calculate Parameters
Use Case Name	Ocean Ecosystem and Shark Parameters Calculation
Use Case Summary	Calculate Parameter Use Case describes how through the shark and buoys located on the surface of water helps calculating water ecosystem various environmental parameters as well as shark's speed, body temperature etc.
Actors	1. Primary Actor – Shark 2. Secondary Actor – Buoy's
Preconditions	1. Shark should have tag fixed. 2. Shark is coming on the surface of the water 3. Tag attached on shark working properly.
Flow of Events	1. Shark comes on the surface of the water and transmits signals to buoys through the tag fixed on their body. 2. Signals sends data such as pressure, speed and temperature of shark. It also sends environmental data such as water temperature, current location, salinity etc. through the tag.
Exception	1. If tag not attached correctly and got detached from the body of shark these parameters cannot be calculated. 2. Also if tag gets broken due to movements or other factors, parameters calculation is not possible.
Post Condition	1. Shark tag successfully calculates data when comes on the surface of the water.
Non-Functional Requirements	1. Tag for tagging should be of high quality and reliable. 2. Tag should have a good life time, minimum period (years) required so that data can be calculated over a period of time.

UC 1.5 – Data Transmission Use Case Description

Use Case ID	UC-1.5 Data Transmission
Use Case Name	Data Transmission through Satellite at Research Laboratory
Use Case Summary	Data transmission Use Case describes data collection from shark tag sent to buoys and through the use of GPS systems it is transmitted to central research laboratory.
Actors	1. Primary Actor – Buoy's 2. Secondary Actor – Satellite
Preconditions	1. Data is ready for transmission with buoys. 2. Active network or communication system should be there for data transmission.
Flow of Events	1. The buoys located on the surface of water are ready with signals for data transmission. 2. Buoys establishes communication with satellite system. 3. After successful establishment of active network between buoys and satellite data is transmitted to central research laboratory. 4. After reaching at research laboratory it is updated in database.
Alternate Flow	Alternate Flow 1 1. In step 2 above of main flow of events if buoys unable to communicate with satellite then the network is checked for error. 2. After checking for error it is resolved and then buoys tries again to establish connection for data transmission to research laboratory.
Exception	1. If buoys do not work properly then it is not possible to send data to research lab. 2. Also if buoys malfunction, data can be lost or modified which leads to incorrect transmission of data at research laboratory.
Post Condition	1. Data is transmitted successfully to central research laboratory through the use of active GPS systems and locator/Buoys.
Non-Functional Requirements	1. Satellite network should have 99.99% uptime for data transmission.

A.1.1 Shark Capture Activity Diagram

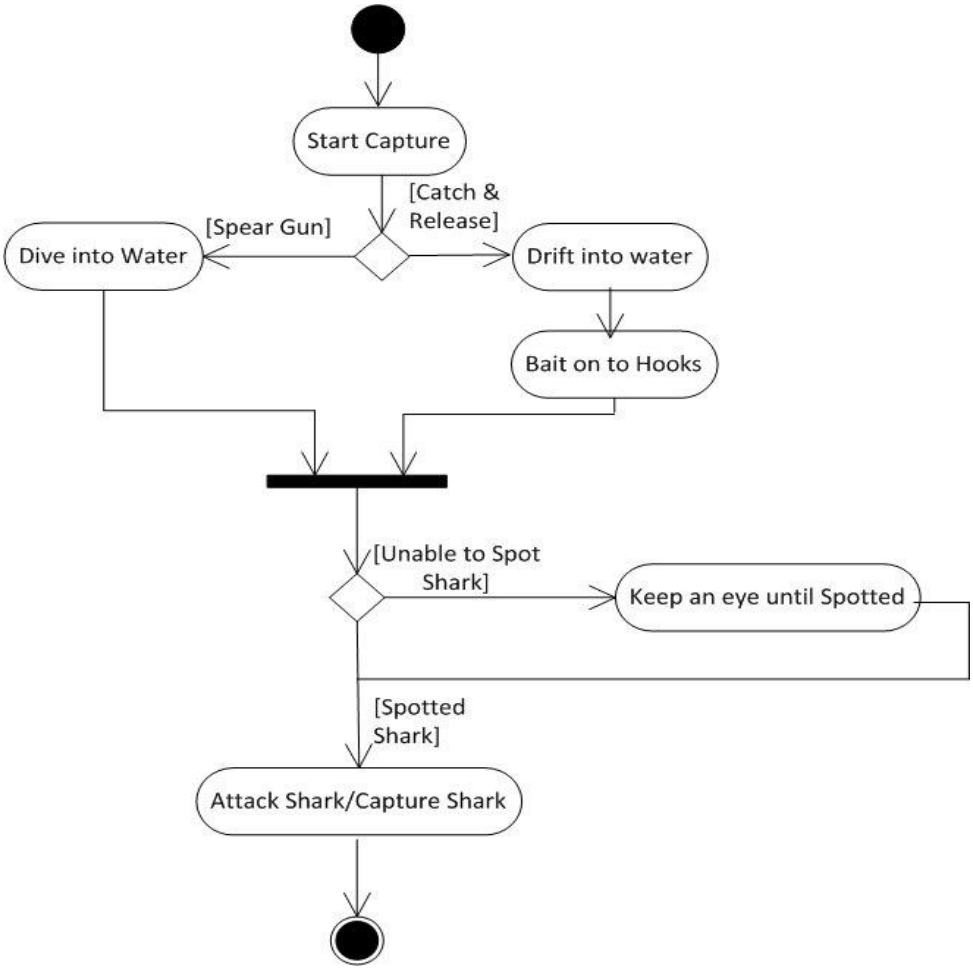


Figure 2 Shark Capture

A.1.2 Shark Tagging Activity Diagram

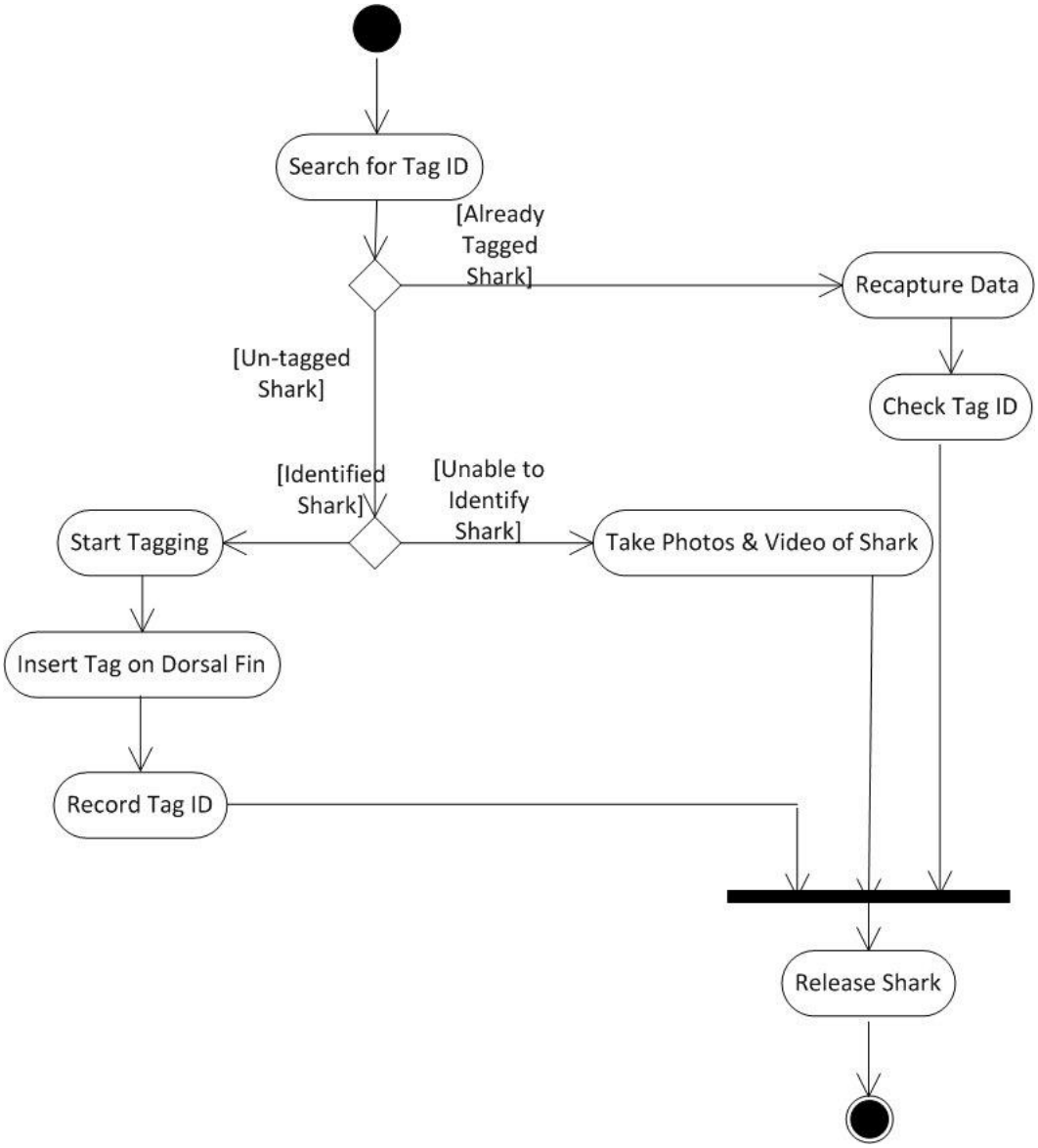


Figure 3 Shark Tagging

A.1.3 Shark Biological Sample Collection Activity Diagram

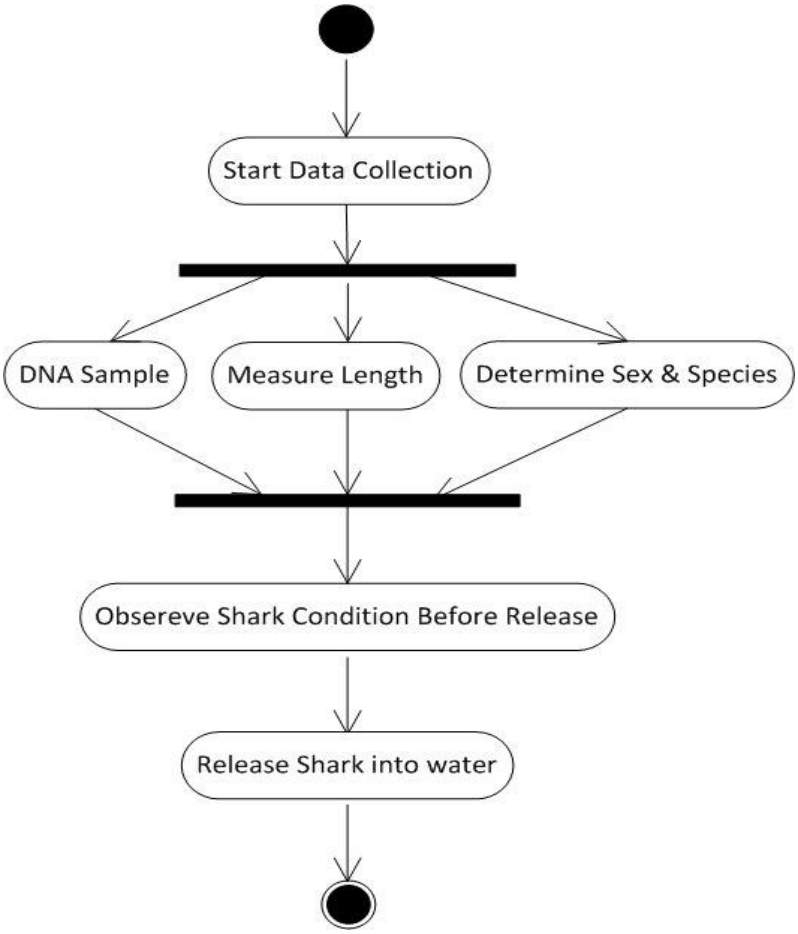


Figure 4 Shark Sample Collection

A.1.4 Shark & Environmental Parameters Calculation Activity Diagram

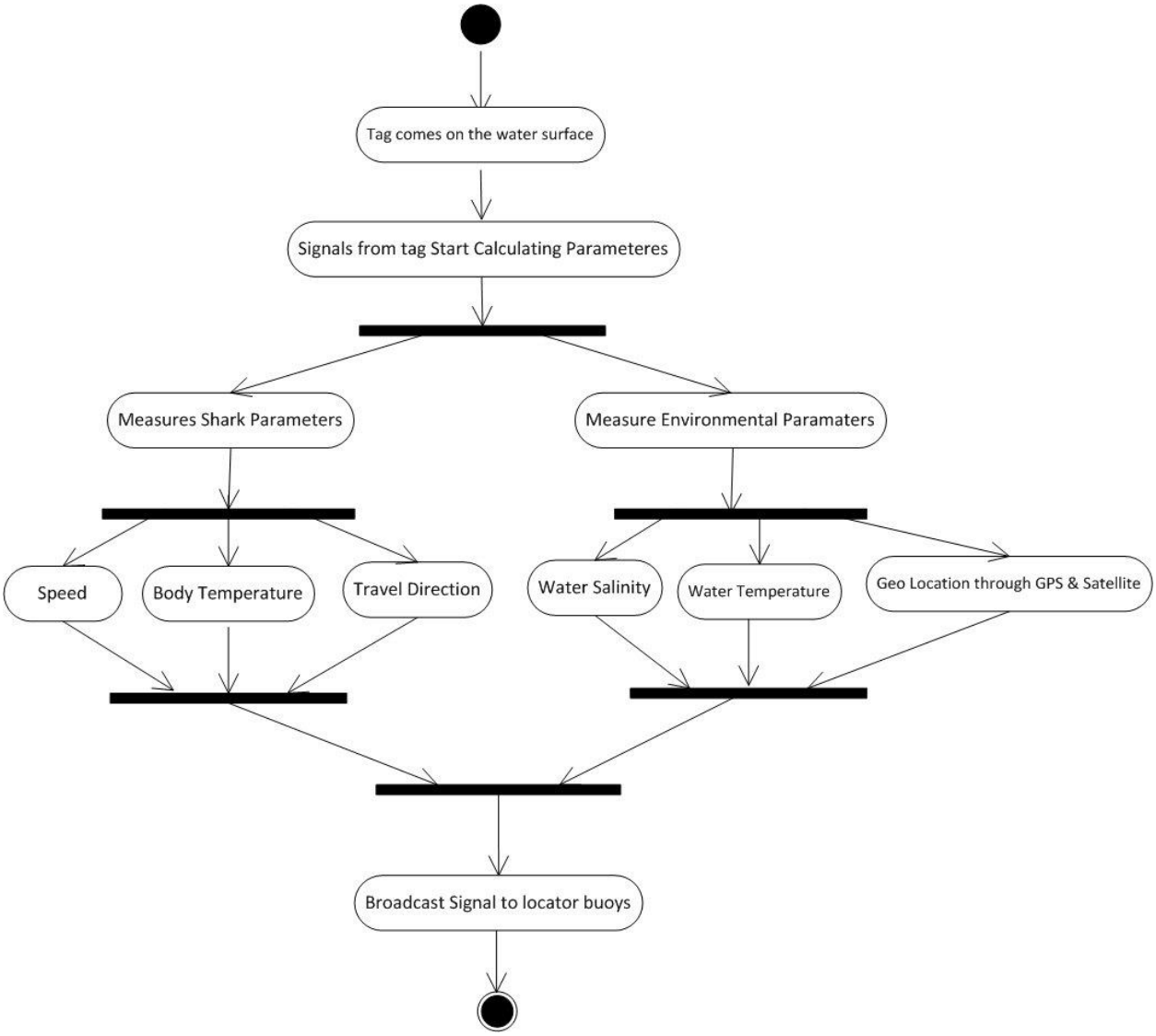


Figure 5 Calculate Parameters

A.1.5 Data Transmission to Central Research Location Activity Diagram

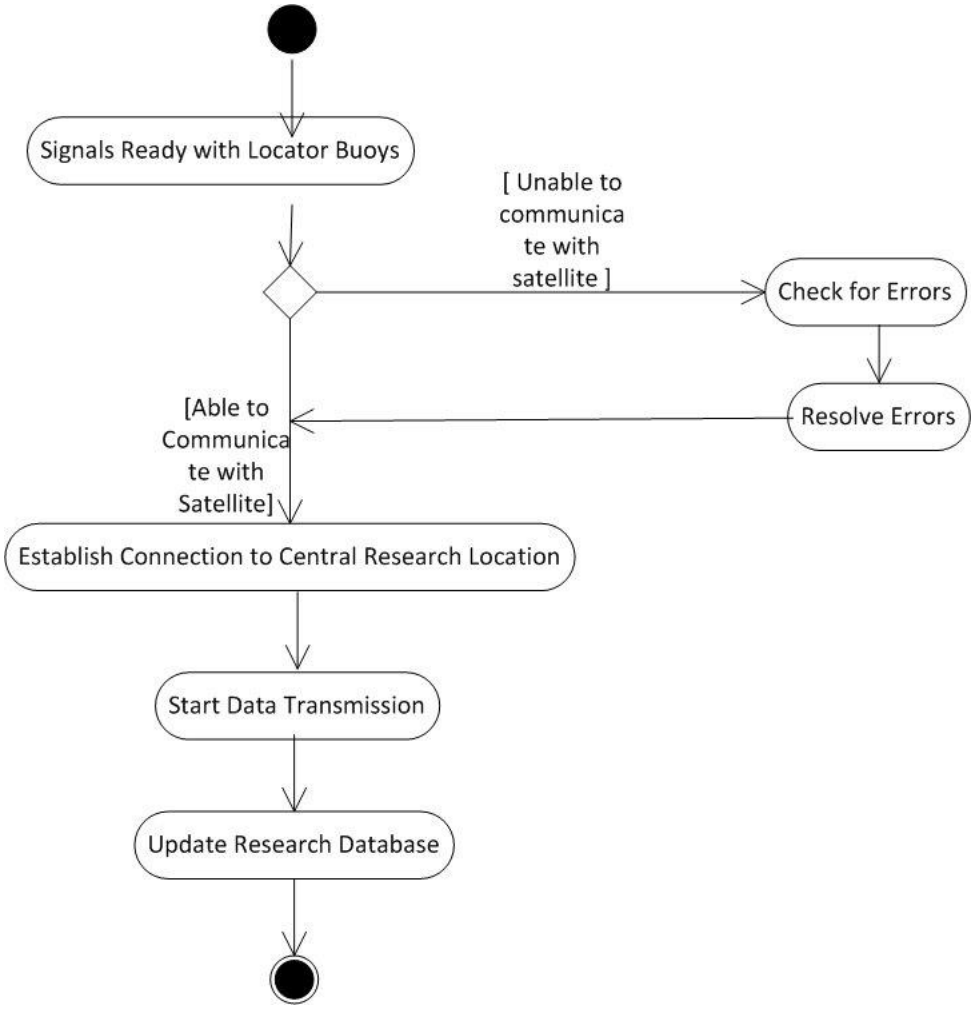


Figure 6 Data Transmission

B. Shark Tracking – Use Case Diagram 2

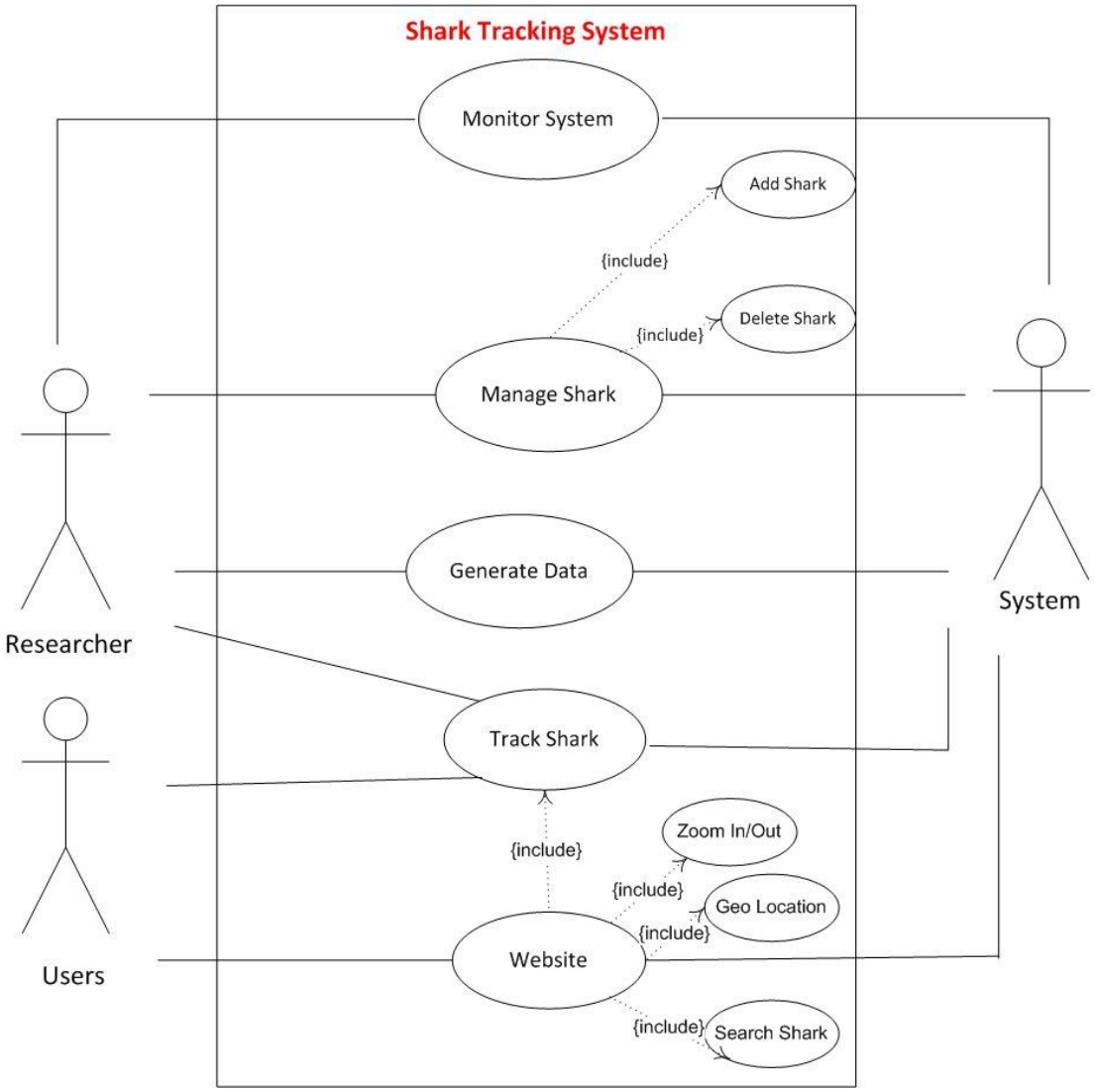


Figure 7 Shark Tracking Use Case Diagram 2

UC 2.1 – Monitor System Use Case Description

Use Case ID	UC-2.1 Monitor System

Use Case Name	Monitoring the Internal system
Use Case Summary	Monitoring system use case describes researcher monitors and maintain the system so that it can be utilized for shark tracking reliably and data can be used for real-time explorations.
Actors	1. Primary Actor – Researcher 2. Secondary Actor – System
Preconditions	1. Researcher should have access and special rights to monitor system and make changes if required. 2. Researcher should have expertise on monitoring system so that it does not cause any harm to existing data while monitoring and troubleshooting system for errors and faults.
Flow of Events	1. The Researcher login to the system with Login ID and password. 2. After login to the system, starts monitoring activity. 3. Researcher check is in for healthy remote connection is established between satellite and the system so that data is coming in real-time and stored in database. 4. Simultaneously checks for hardware and software working properly. Updates the application/software if required and fixes the hardware faults if any. 5. The Researcher then logouts the system.
Exception	1. If Researcher do not have special right he is unable to monitor system for faults and error. 2. Also if researcher is not an expert and have no knowledge how to maintain the system will not be able to resolve errors.
Frequency of Use	1. Monitor system use case runs throughout the lifecycle of shark tracking system.
Post Condition	1. Researcher monitor system well throughout the lifetime of system and software and runs it successfully. 2. System have required configuration with proper functioning and updates and upgrades done on time.
Non-Functional Requirements	1. System should be up for 99.99% time.

UC 2.2 – Manage Shark Use Case Description

Use Case ID	UC-2.2 Manage Shark
Use Case Name	Managing the Shark
Use Case Summary	Manage Shark Use case describes researcher add and deletes shark for purpose of tracking them and keep their information preserved for future study and analysis.
Actors	1. Primary Actor – Researcher 2. Secondary Actor – System
Preconditions	1. Researcher should have access and special rights to manage system and add and delete sharks. 2. Researcher should be updated with information in real-time to add and delete shark.
Flow of Events	1. The Researcher login to the system with Login ID and password. 2. After login to the system, starts managing process. 3. Researcher check is in with the team on-site if any new shark is tagged. 4. When new shark is tagged and released in water, researcher at research location add shark with its complete details and update in the system. 5. All if any pictures of shark are taken that is also update in the database. 6. Secondly if researcher gets information for shark tagged is dead or shark is no longer tracked due to fall of tag from its body. 7. Researcher then delete shark from the database but prior deleting saves its historic information helpful for future records. 8. The Researcher then logouts the system.
Exception	1. If Researcher do not have receive correct information form on-site shark tagging team, might end up updating incorrect information
Frequency of Use	1. Management of shark in the system use case runs throughout the lifecycle of shark tracking system.

Post Condition	1. Researcher is able to manage shark with add and delete feature and saving information in database for future records.
Non-Functional Requirements	1. Software should be reliable enough to keep information preserved in the system with proper backup facility.

UC 2.3 – Generate Data Shark Use Case Description

Use Case ID	UC-2.3 Generate Data
Use Case Name	Generate data from each shark through web application
Use Case Summary	Generate data use case describes that this feature enables researcher to have data generated from each shark on the database and can see this data through web application. Also this data helps in generating various reports in formats required.
Actors	1. Primary Actor – Researcher 2. Secondary Actor – System
Preconditions	1. Researcher should have access and special rights to operate on data generation. 2. System should be updated in real-time with every information and have that info stored as well.
Flow of Events	1. The Researcher login to the system with Login ID and password. 2. After login to the system, researcher select shark whosoever data or history he/she wants for study or analysis purpose. 3. Researcher also selects various parameters for required purpose based on which data will be extracted from the system. 4. Based on filter criteria, data will be generated and display to researcher. 5. Researcher then should be able to generate report and graphs in various format available and also can print those records and save them for future explorations. 6. The Researcher then logouts the system.
Exception	1. If System is not updated then data generated from the web will be incorrect.
Frequency of Use	1. Data can be generated at any point of time throughout the lifetime of the shark tracking system.
Post Condition	1. Researcher able to generate data from each shark and extract reports and graphs in various formats available.
Non-Functional Requirements	1. Software should be reliable enough to keep information preserved in the system with proper backup facility.

UC 2.4 – Track Shark Use Case Description

Use Case ID	UC-2.4 Track Shark Use Case
Use Case Name	Shark Tracking through Web Application or Mobile Application
Use Case Summary	Track Shark use case describes the process followed for shark tracking by researcher or any user for general information or any other specific use. As tracking shark provides with real-time information of sharks as in which location a particular shark is.
Actors	1. Primary Actor – Researcher, user 2. Secondary Actor – System
Preconditions	1. Web Application or Mobile application should be ready and already launched for users as well as researcher. 2. System should be updated in real-time with every information and have that info stored as well.
Flow of Events	1. The Researcher or user opens website/ mobile application which has track option on it to track all the sharks tagged till date. 2. The Researcher or user then clicks on shark icon displayed on the website or mobile app. 3. Website or mobile app has world map integration onto it. Clicking on shark icon will display pop dialog box with shark current details. 4. Further clicking on view info, will display complete record of shark including latitude longitude, path travelled, patterns, last seen at date, time and location. Also Zoon in/Zoom out on maps can be done to see geo-location features. 5. Same Process can be performed for all the sharks to track them and see their history for path travelled, current location etc. 6. Researcher or user after tracking may exit the website or mobile application.
Exception	1. If there is network issue or server down problem, then user may not be able to track shark at that particular time.
Frequency of Use	1. Track Shark feature will be used at all point of time throughout the lifetime of the shark tracking system. This is important feature.

Post Condition	1. Researcher /User able to track shark in real-time with all the relevant details required by them.
Non-Functional Requirements	1. Tracking information revealed out by the application should be 100% correct and reliable. 2. Application should be up 99.99% of time. 3. All feature for tracking shark on the website should work as per software design.

UC 2.5 – Website Use Case Description

Use Case ID	UC-2.5 Website
Use Case Name	Website Use case for shark Tracking
Use Case Summary	Website use case describes features incorporated for the shark tracking with other additional features in it. Website is the front end which user sees and use for recording or noting shark details for information updating and to understand their characteristics along with water ecosystem.
Actors	1. Primary Actor – Researcher, User 2. Secondary Actor – System
Preconditions	1. Web Application or Mobile application should be ready and already launched for users as well as researcher. 2. System should be updated in real-time with every information and have that info stored as well.
Flow of Events	1. The Researcher or user opens website/ mobile application for shark information. 2. Website can be used to see the tagged sharks, their track information, user can search a particular shark of interest based on filter criteria. 3. The researcher when want to search a particular shark, he clicks on search button on the website. 4. Search Button will prompt for various parameter selection based on which particular shark will be searched. Various options can be selected from the filter criteria available in the search box. 5. Click on track button will carry some backend activity and based on filter it will search for the relevant shark. 6. Further clicking on view info, will display complete record of shark including latitude longitude, path travelled, patterns, last seen at date, time and location. 7. Also Zoon in/Zoom out feature is available for user on map to have clear visible information. 8. Same Process can be performed for all the sharks to track them and see their history for path travelled, current location etc.

	9. Researcher or user after tracking may exit the website or mobile application.
Frequency of Use	1. Website/Mobile application will be thoroughly used throughout the shark tracking system is working and available for users.
Post Condition	1. User and Researcher able to use the website for track, search and geographical location, their movements, migration patterns etc. of sharks.
Non-Functional Requirements	1. Website should be user friendly, it should easier for anonymous user to track shark and use every feature of website. 2. Information displayed from the website should be reliable. 3. Website should work 24X7

B.2.1 Monitoring System Activity Diagram

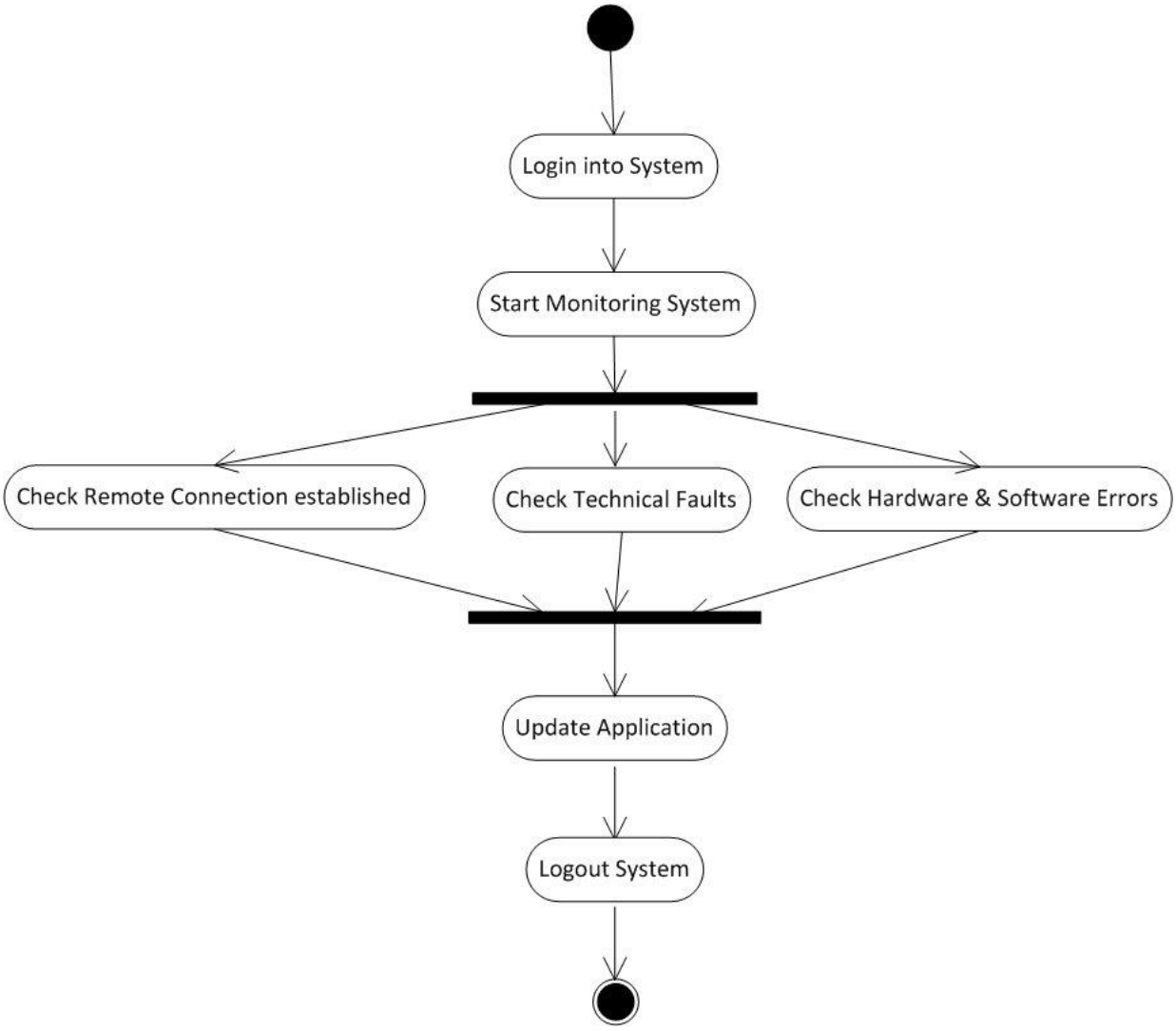


Figure 8 Monitor System

B.2.2 Shark Management Activity Diagram

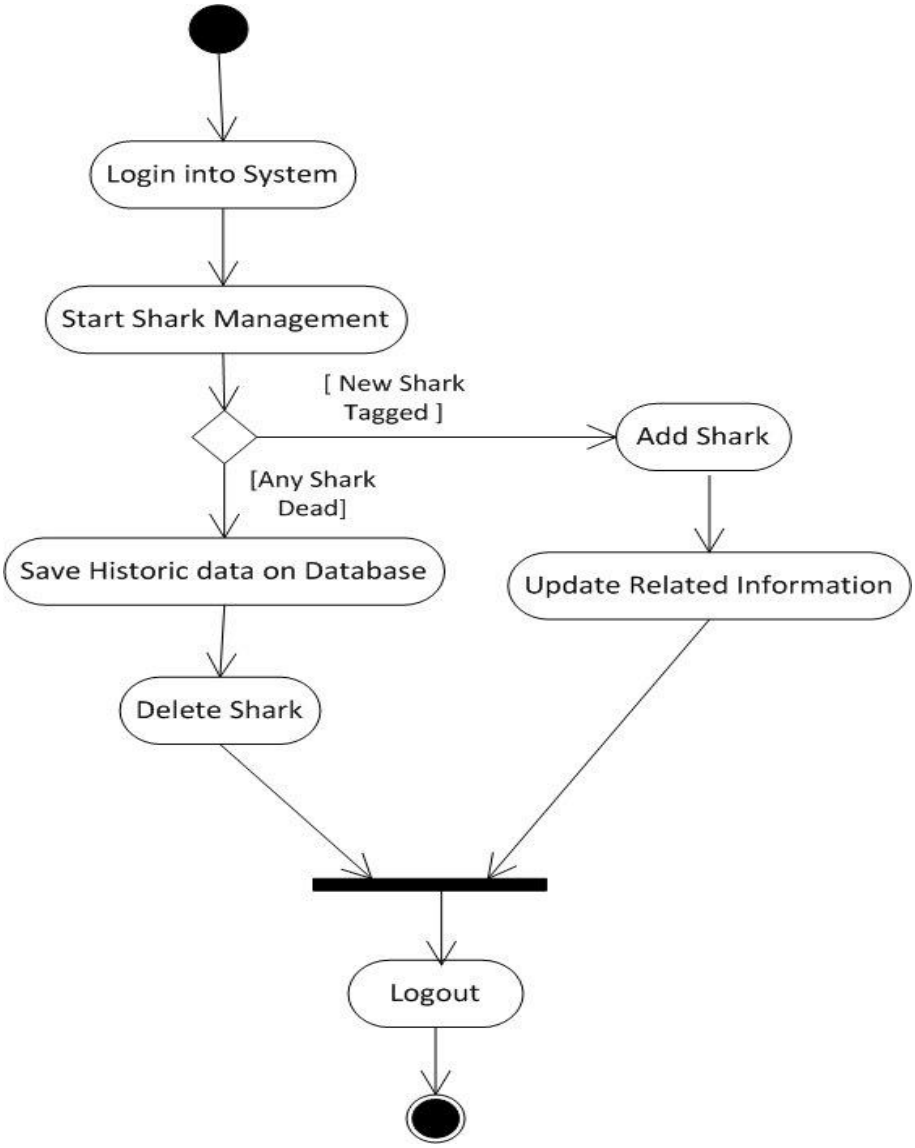


Figure 9 Shark Management

B.2.3 Shark Report Generation Activity Diagram

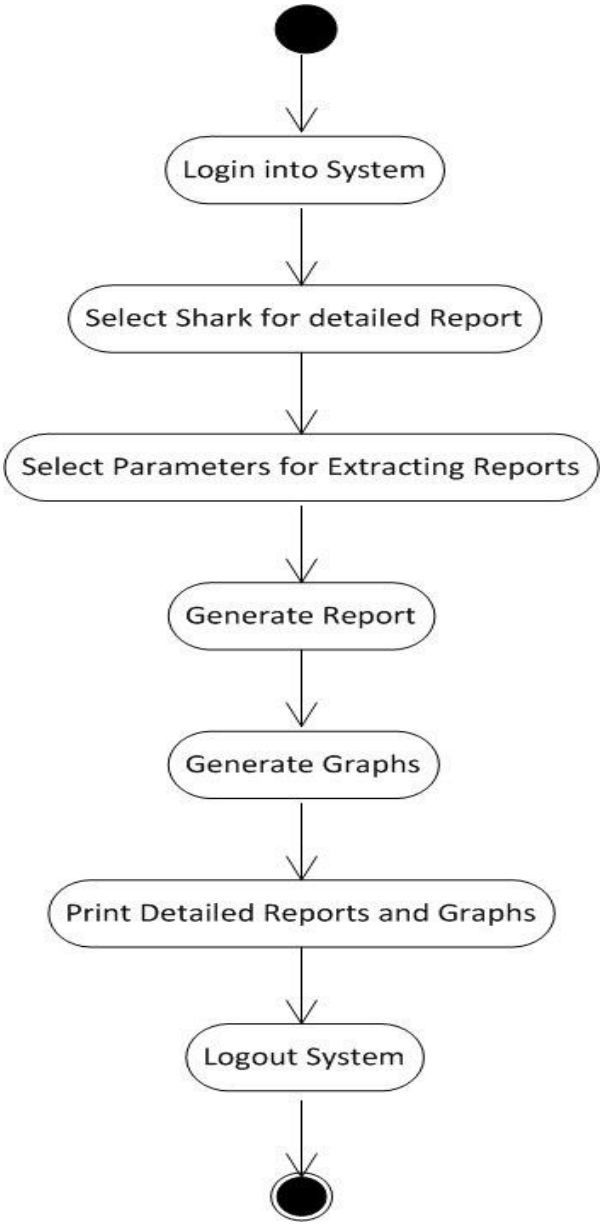


Figure 10 Generate Report

B.2.4 Shark Tracking Activity Diagram

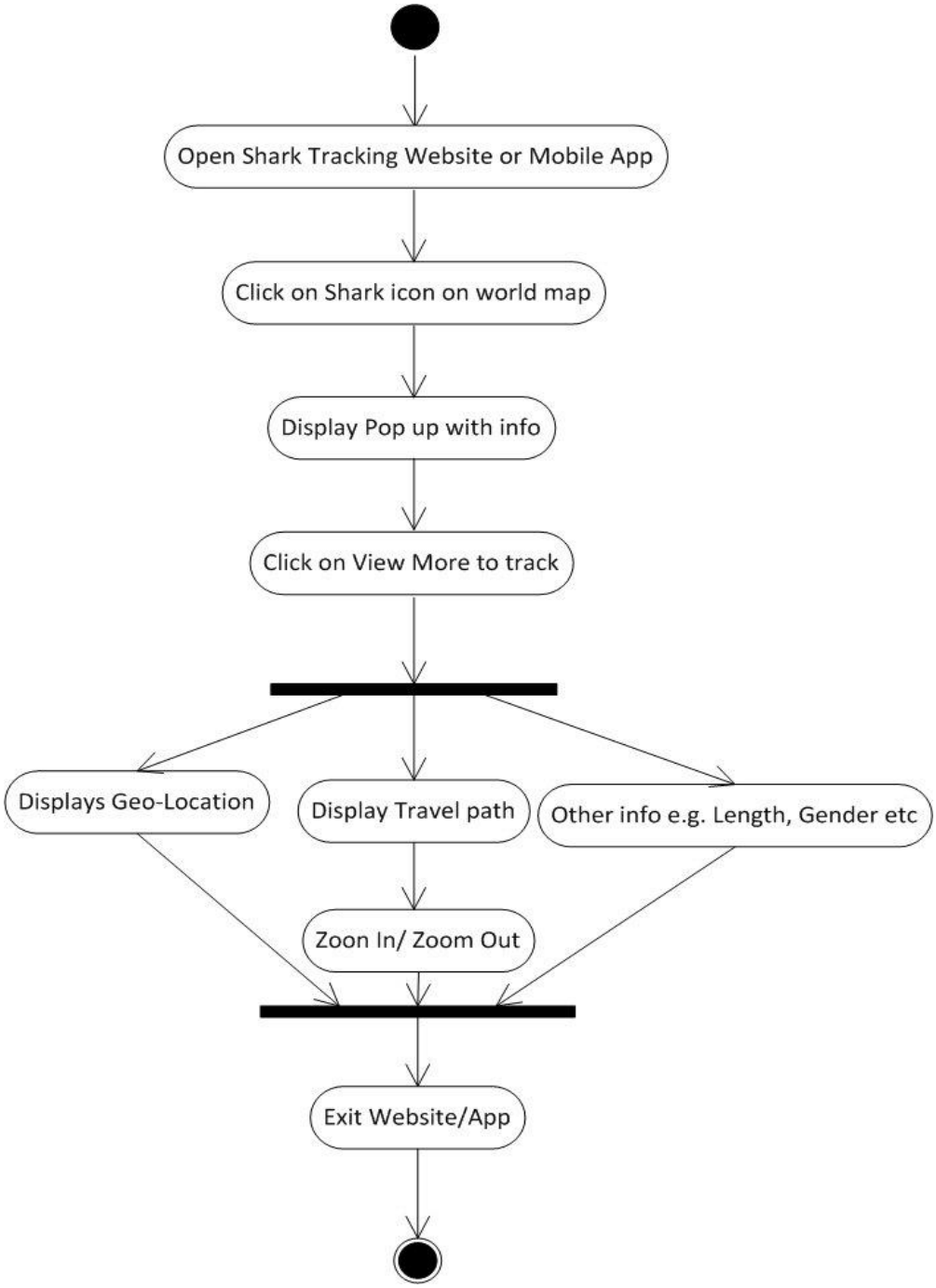


Figure 11 Shark Tracking

B.2.5 Website Features Activity Diagram

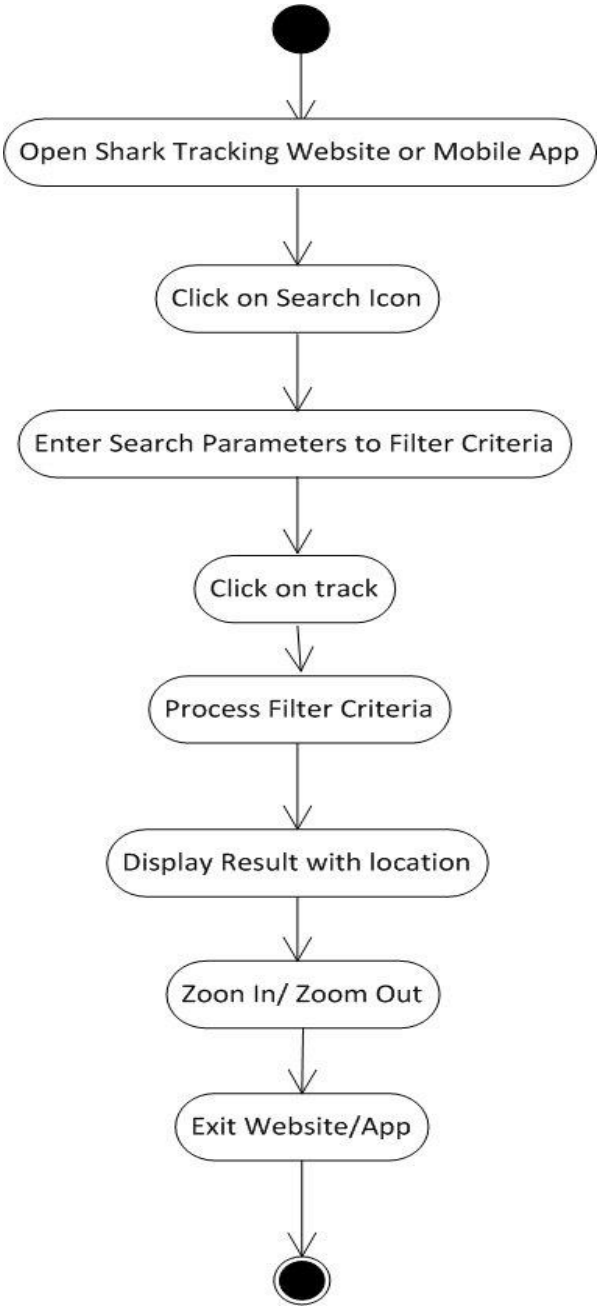


Figure 12 Website Features

C. Shark Tracking Context Class Diagram

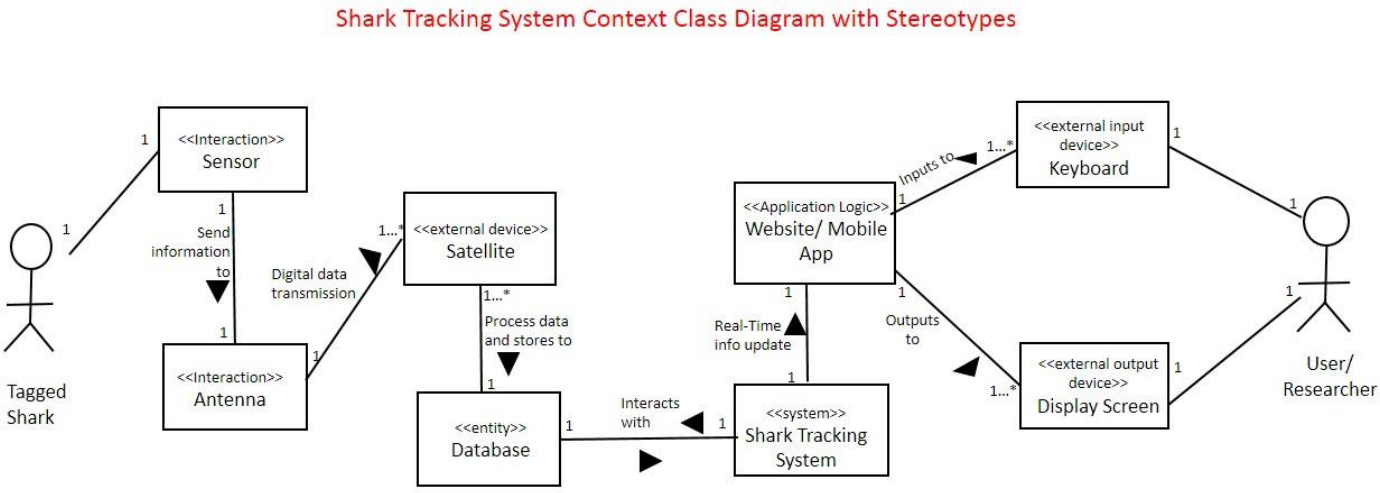


Figure 13 Shark Tracking Context Class Diagram

D. Glossary

A

Activity Diagram

Activity Diagram are graphical representation which shows step by step activities and actions performed by the users of the system with sequence, selection and iteration in it. Also known as behavioral diagram.

C

Context Class Diagram

These diagram represents the external and internal hardware and software of the system. It is also said as black box.

E

Exception

Exceptions in use case diagram descriptions describes the error condition occurred or simply what happens if pre-condition fails.

N

Non-Functional requirements

These are known as Quality Requirements, stated indirectly by the Stakeholder's and are non-actionable. They can viewed or judged.

P

Preconditions

Preconditions are the conditions which must be true/ satisfied for a use case to start.

Post-Conditions

Describes the state of the system after the use case has been executed.

S

Stereotypes

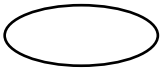
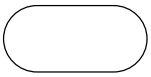
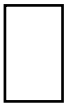
Stereotypes are generally a text written in simple English to distinguish between the type of classes.

U

Use Case

Use case are descriptions in abstract terms of how actor uses the system to accomplish goals. Use cases are technology independent and incorporate functional requirements in them. Use cases are always written from actor's point of view.

E. Symbols Used Meaning

Symbol	Meaning
	Stick Figure represents Actor
	Oval Symbol represents Use Case
	Black filled Circle represents Initial State
	Circle inside circle represents Final State
	Arrow represents Control Flow
	Diamond shape represents Selections/conditions/ decision. It is known as decision box.
	Represents activity state
	Box Represents system in use case diagram

F. References

[1] Souppouris, Aaron. 2013.You can track sharks off the east coast in real time. The Verge. http://www.theverge.com/2013/8/29/4671128/shark-tracking-in-real-time-ocearch-global-tracker

[2] Hammerschlag, N., et al., A review of shark satellite tagging studies, J. Exp. Mar. Biol. Ecol. (2011), doi:10.1016/j.jembe.2010.12.012.

http://rjd.miami.edu/assets/pdfs/pubs/Hammerschlag%20et%20al.%202011.%20JEMBE.pdf

[3] Gottesdiener, Ellen. 2003. Use Cases: Best Practices. IBM Rational Software Publication. http://www.eg.bucknell.edu/~cs475/F04-S05/useCases.pdf

[4] Kohler, N.E. and P.A. Turner. 2001. Shark tagging: a review of conventional methods and studies. Environmental Biology of Fishes 60:191-2223. ftp://swfscftp.noaa.gov/users/hdewer/papers/Endnote/Kohler,Turner'01_tag%20shark%20review.pdf

[5] Harris, Tom.2001. How Sharks Work. http://science.howstuffworks.com/zoology/marine-life/shark.htm

[6] Anonymous. 2010. Electronic Tags Overview. Hawaii Institute of Marine Biology. http://www.hawaii.edu/himb/ReefPredator/Tools.htm

[7] Anonymous. NOAA's National Marine Fisheries Service. Cooperative Shark Tagging Program. http://na.nefsc.noaa.gov/sharks/cstpbooklet.pdf

[8] Potenski, Matthew.Whale Shark Research Methods. Nova Southeastern University. http://www.fieldtripearth.org/print-article.xml?id=1268

[9] Bertagna, Patrick. 2010. How does a GPS Tracking System works.EE Times. GTX Corp. http://www.eetimes.com/document.asp?doc_id=1278363

[10] Anonymous.2007-2012. Tag Technology. Tag-a-Giant Website. http://tagagiant.org/science/tag-technology

[11] Comfort, Christina.2012. Watch how researchers get up close and personal with deep water sharks in the North Pacific. University of Hawaii. Time. Retrieved from http://www.youtube.com/watch?v=pwTr-nWPwGw

[12] Ocearch Global Shark Tracker. http://www.ocearch.org/

[13] The Great White Shark Tracker App. http://www.expeditionwhiteshark.com/