STEP THREE PTY LTD

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Shark Safe - Final Report

SMS Annual Competitive Grant 2017/2018

12th June 2018

Executive Summary

Shark Safe is a wearable waterproof wristband that alerts users when a shark has entered their vicinity. We use the already available VR4G shark buoy data combined with trusted and economic radio technology to create a cheap and effective safety warning system. The wristbands can be worn at the beach and in the sea. Shark Safe also increases water safety while not harming the health of Sharks in the environment.

With the help of the SMS Annual Competitive Grant, Step Three Pty Ltd were able to build all three component parts required for the system. Consisting of - wearable wristbands, base station transmitter and cloud based back-end data services. We also applied for and were granted a patent for this system. Upon completion of the 3 elements we were able to run a real world beach test that proved the viability of the technology successfully.

Please refer to Appendix 1 for an illustrated overview of how the system works.

Please also note that Step Three Ltd Pty reserve the right of use of our company name and the names of directors in any public correspondence. Approval must be sought from Step Three Pty Ltd and its directors before any form of public announcement is made in regards to the Shark Safe project.

Introduction

Sharks can be a general danger to the public and various systems have been put in place to improve the safety of water and beach users. The notification systems previously used have been limited due to not having direct contact with beach users while in the water or even while at the beach. This invention notifies swimmers, surfers or beach users the instant a tagged or sighted shark is reported at their local beach.

Shark Safe notifies you the instant a tagged shark is reported by the VR4G buoy at your local beach. You get informed by a combination of vibration (not in prototype), noise and flashing light. You will be alerted the instant a tagged shark comes into the vicinity of your local beach. Shark Safe is preferable to other solutions as it alerts you to the presence of sharks while you're in the water and also does not require you to have your phone with you at the beach.

Common questions:

How do you know when there are sharks?
We will use the shark tagging and detection buoys program set up by the NSW government at key beaches along the coast. When a tagged shark comes within a 500 metre radius of the buoy, an alert is sent out.

Is this expensive to make?
Shark Safe wristbands could be manufactured for under $5 each. Shark Safe uses simple dependable radio technology to receive warnings, keeping the production cost low.

How long will the battery last on Shark Safe?
It is expected that the shark safe band will last multiple visits to the beach before needing a charge.

How do I charge it?
The band has a usb charging port that can be charged through any standard usb charging point.

What’s it made of?
Shark Safe is a combination of electrical components encased in waterproof silicone.

Materials and Methods

The disclosed Shark Safe alert system uses shark buoy or other shark data to warn swimmers, surfers or beach users of tagged or sighted sharks entering the local vicinity – while they are in the water or nearby.

Please refer to Appendix 1 for an illustrated overview.

To complete this we have three key elements comprising the invention as a whole:

A1. A cloud based data service that tracks shark buoy or other shark data and then filters the feed by location. When a shark is detected it signals the relevant radio base station at that specific beach.

A2. A radio base station or network of radio base stations which will exist at each of the beaches where sharks have been detected. These consist of internet connectivity, a simple operating system and a radio transmitter. Once these have received an alert from the cloud based data service they broadcast over radio to the local area the existence of a shark in that area.

Please refer to Appendix 2 and 2.b for images of final prototype base station and 4 for images of the test site.

A3. A wristband or personal device consisting but not limited to - an alert system and radio receiver. The radio receiver only reacts to the pre-programmed signal from the radio base station. Once this signal is received it triggers an alert made up but not limited to – audio, visual and vibration signals. This informs the user that a shark is in their immediate vicinity.

Please refer to Appendix 3 and 3.b for images of final electronics and wristband prototype.

Results

Shark Safe testing was broadly a success. The wristband was tested at the beach and in the sea. The weather conditions on the test day were challenging, both windy and raining and this did not limit performance. We were able to send and confirm 4 fake shark signals using a temporary fake twitter shark feed based on the information the VR4G data posts. These signals were all received and confirmed up to a distance of 400 metres from the base station. This was the maximum distance testable in real world conditions, not the maximum receiving distance of the device. In a point to point test we were able to confirm signals received at a distance of 4.5km. This was however a dry test on land. As the test base station was unable to have a external visible antenna installed on the site we did not have have clear visual access overlooking the beach, we can surmise that performance would be beyond the tested range, although we were not able to find a distance limit in our real world tests. The limit to the real world test was geographical - the width of the beach.

Some limitation and improvements were noted during the test phases. These are listed under ‘discussion’.

Please refer to Appendix 5 for images from the test day.

Discussion

A. Known potential improvements:

Improved redundancy of communications on base station before launch.
It was noted that for real world usage, the communications would need have 100% redundancy. Multiple data connection points would be advisable.

Improved build quality of wristband construction.
Due to cost limitations we were only able to craft waterproof solutions based on hand made technology. While this was sufficient for the test it would not be durable. A manufacturing run of these devices would use as our recommendation a silicone injected mold to form a reliable waterproof casing and reduce size.

Network operations required to ensure cloud based services are always working.
A remote monitoring system to guarantee 100% working time.

More sharks should be reported.
The system would be improved if shark detection services move beyond just tagged methodology to systems such as visual shark detection. At the least an increase in tagging would benefit the system.

More Buoys at more beaches.
More buoys increases the viability and likelihood of a broad take up of this product.

B. Changes in action plan.

In the process of enacting the plan agreed with the DPI we had to pivot our approach a few times. It quickly became clear that it would not be possible to use a prototyping company to produce our 10 wristbands due to cost limits. Therefore we set out to learn the manufacturing process for the electronics ourselves. This had the effect of reducing costs but greatly increasing our personal involvement in time. We had already planned to build the prototype base station and cloud data services ourselves, so these were not affected. The change in methodology did have the effect of greatly improving our subject knowledge and it is our assertion that this is a key reason the project was successful.

Also we were unable to source vibration motors in time to meet the deadline, so we were not able to include that element in the wristband electronics. While this did not prove an impediment to the test results it would be recommended to include this element in subsequent productions.

Recommendations

We believe this is a viable technical solution allowing beach and ocean users to receive communications from the VR4G shark buoys. We recommend that this project goes to public production via either of these two methods:

A. Government led initiative

The DPI or other government office takes over this project. This would involve:

1. Rolling out the base stations to all VR4G beach locations.
2. Ongoing network support and improvement of the cloud based data services
3. Final design and manufacture of the wristbands.

Step Three Pty Ltd's input would be limited to initial technical handover and then license fees for the patented system. Alternatively rights in perpetuity could be purchased.

B. Private enterprise initiative in collaboration with government.

The DPI or other government office works in conjunction with a private enterprise designated by themselves. This collaborative effort would involve:

1. Rolling out the base stations to all VR4G beach locations.
2. Ongoing network support and improvement of the cloud based data services.
3. Final design and manufacture of the wristbands.

Step Three Pty Ltd's input would be limited to initial technical handover and then license fees for the patented system. Alternatively rights in perpetuity could be purchased.

C. Other method.

If either of A or B do not seem plausible pathways to move the project forward. Please contact Step Three to discuss other options.

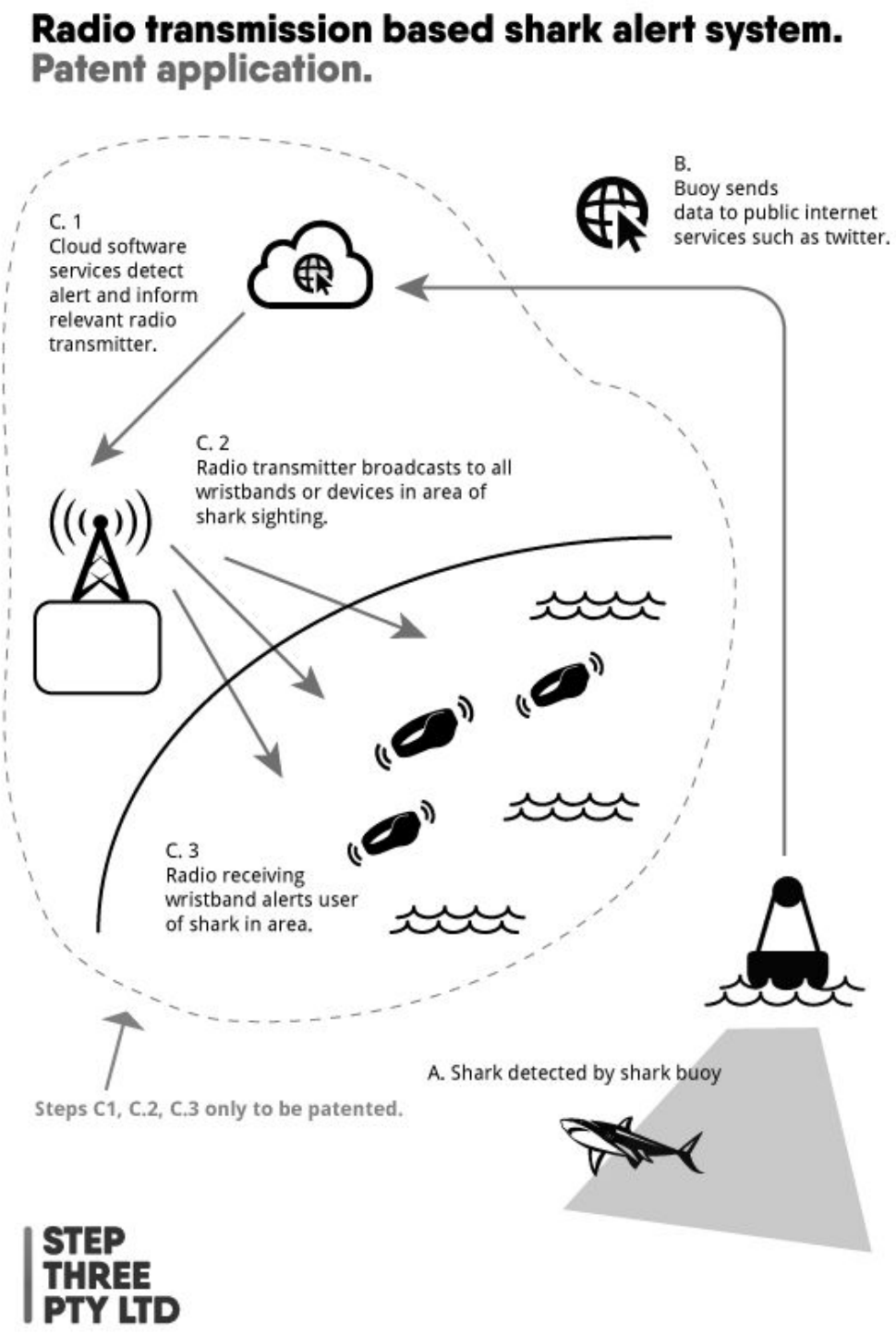
References

Patent reference.
Application Number 2017101768
IP Australia Batch Reference SPBI-0001461972
Submitted By STEP THREE PTY LTD

Media and Publicity Notice

Please also note that Step Three Ltd Pty reserve the right of use of our company name and the names of directors in any public correspondence. Approval must be sought from Step Three Pty Ltd and its directors before any form of public announcement is made in regards to the Shark Safe project.

Appendix


Radio transmission based shark alert system.
Patent application.
B.
Buoy sends
data to public internet
services such as twitter.
C. 1
Cloud software
services detect
alert and inform
relevant radio
transmitter.
C. 2
Radio transmitter broadcasts to all
wristbands or devices in area of
shark sighting.
C. 3
Radio receiving
wristband alerts user
of shark in area.
A. Shark detected by shark buoy
Steps C1, C.2, C.3 only to be patented.
STEP
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