Field test for the i-Fish device (Draft)

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ABSTRACT

This research project focuses on developing and designing the i-Fish prototype, a micro fisheries activity assistant system capable of integrating digital crew declaration system, emergency distress calls, and trajectory recording. The microdevice used to deploy i-Fish has enough computational powers to achieve the above tasks and can integrate with external modules, i.e., GSM transmitter and receivers, GPS receivers, and external storages. Microdevices require much less energy than regular computers and can be activated using mobile power banks, which makes it suitable to carry on fishing rafts and sampans which do not have a stable source of electric power. Development of the software will also take account of using operations that consume less power to lengthen the operation time of i-Fish. Current stage of development is in the field test stage. Results will be used to adjust the device hardware and software.

***K*eywords** Fisheries assistant system · Coastal sheries · Microdevices

1 Introduction

The i-Fish device is a second generation improvement design of the original personal fisheries assistant system mention in [1]. These devices are to be installed on unpowered fishing vessels and thus must be self-sustaining. We currently use a portable USB battery pack to support this device. The complete spec and design of the device will be documented in another paper upon completion or end of the project.

2 Experiment settings

This field test was done on a CT2 class (gross tonnage ≥ 10 and < 20) fishing vessel. This is a recreational boat fishing which carries sports fishermen using mainly pole and lines fishing gear (see Figures 1,**??**). General summary of the parameters on the test date (2018/11/29) is shown in Table 1. Typically, these type of small vessel do not travel too far, so our assumption of using GSM networks can be doable.

Figure 1: **Recreational fishing vessel (port view).** This is a rather small vessel 65 foot long and carries at most 23 people.

3 Results

3.1 Monitoring

The current configuration of i-Fish reports position at 30 second interval. It can be adjusted to at most 1Hz, i.e., 1 second interval, due to the capability of the GPS IC we have used.

Table 1: **Field test parameters.** This table shows the conditions of the day which the field test was conducted.

Parameter	Content
Vessel name	Chyuan Long
Vessel tonnage	CT2
Fishing gear	Pole and line (primary)
Fishing port	Badouzi fishing port
Port exit	2018/11/29 18:00
Port entry	2018/11/29 23:40
Length of voyage	5 hours 40 minutes
Area of operation	Coastal area of Keelung, Taiwan
Weather condition	Partly cloudy
Wind	East winds to Southeast winds
Wind force	5-6
Gust	8
wave height	1-2m

Figure 2: **Recreational fishing vessel (bow view).** The bow view of the vessel shows the width of the recreational vessel.

The full run of this field run experiment is shown in Figure 6. A detailed plot in Figure 7 can be used for further scientific studies.

3.2 Device condition

Before departure, our team has made final checks on the system to see if everything is running (see Figure 8). The test includes all modules and the central monitoring system distant away. Finally, the device is placed at the bow of the vessel close to the starboard side and ready to go. As shown in Figure 9, rough sea conditions is expected and i-Fish has been designed to resist water and dust at an IP67 level [2].

i-Fish has a large internal memory and a decent processor so that it can be incorporated with many applications. One of the applications that were installed is to detect where the vessel is, i.e., showing the port name (Figure 10) or marine protected area (MPA) name. This can help fisherman identify if they are in a fishing ban area or not. Other applications include summarizing past catches in the area, gear used in this area, and the frequency of fishing vessels appearing in this area. All of this information can be updated automatically when i-Fish is connected to the network.

3.3 Emergency reports

One of the major use of the i-Fish device is to issue distress calls. Once the button is triggered on the device, the central monitoring station will be notified as shown in Figure 12, and proper SOP can be executed. However, if the device leaves communication range, there is currently no solution for it to propagate the distress signal back unless satellite communication modules is built into the system.

3.4 Power consumptions

The power consumption of the device is measured at 160mA at 5V during operation. The can be converted to 160mAh per hour at 5V. Our USB battery pack has a capacity of 12800mAh at 3.7V. Assuming a conversion loss of 10% (due

(a) Fishing vessel loading passengers and at coast guard inspection post.

(b) Leaving the inspection post.

(c) Turing directions to exit the port.

(d) Leaving the inner jetty of the port.

Figure 3: **Fishing vessel leaving the port for operation.** The fishing vessel is allowed to leave the port after coast guard inspection.

to raising the voltage from 3.7V (lithium batteries) to 5V):

$$\begin{aligned} 12800MAh * 3.7V * 90\% &= x * 5V \\ x &= 8524.8mAh, \end{aligned}$$

the USB battery pack can provide 8524.8mAh of electricity at 5V.

Since i-Fish consumes 160mAh per hour, we can approximate the lifetime of i-Fish running on 1 USB battery pack:

$$8524.8mAh/160mAh = 53.28h,$$

which is approximately a quarter more than 2 days.

4 Conclusion

The trial run was a success as we have everything running as expected. The device operates on wet sea conditions and the waterproof was adequate. Central monitoring station can integrate the signals from i-Fish with other tracking systems. Moreover, the team has also caught 34 largehead hairtail (Trichiurus lepturus) during the run using the pole and line fishing. Meanwhile, we are organizing a second run to test the device again.

References

[1] J.-C. Luo, H.-Y. Tsai, M.-H. Lu, S.-Y. Wang, W.-H. Hung, and W. W. Hsu, "A prototype design of a smart and portable coastal fisheries assistant system," in *International Conference on Advance Research Approaches in Applied Sciences and Engineering Technology (ASET-2018)*, 2018.

[2] (2018) IP code. [Online]. Available: https://en.wikipedia.org/wiki/IP_Code

Figure 4: **The full trajectory of this field test.** This field test is a 5 hour round trip from Badouzi fishing port.

(a) Fishing vessel exits Badouzi port.

(b) Navigating in the open seas.

(c) The fishing vessels stops for pole and line operation.

(d) Moving out to another fishing ground.

Figure 5: **Fishing operation.** The recreational fishing vessel carries sports fisher to coastal waters for fun.

Figure 6: **The full trajectory of this field test.** This field test is a 5 hour round trip from Badouzi fishing port.

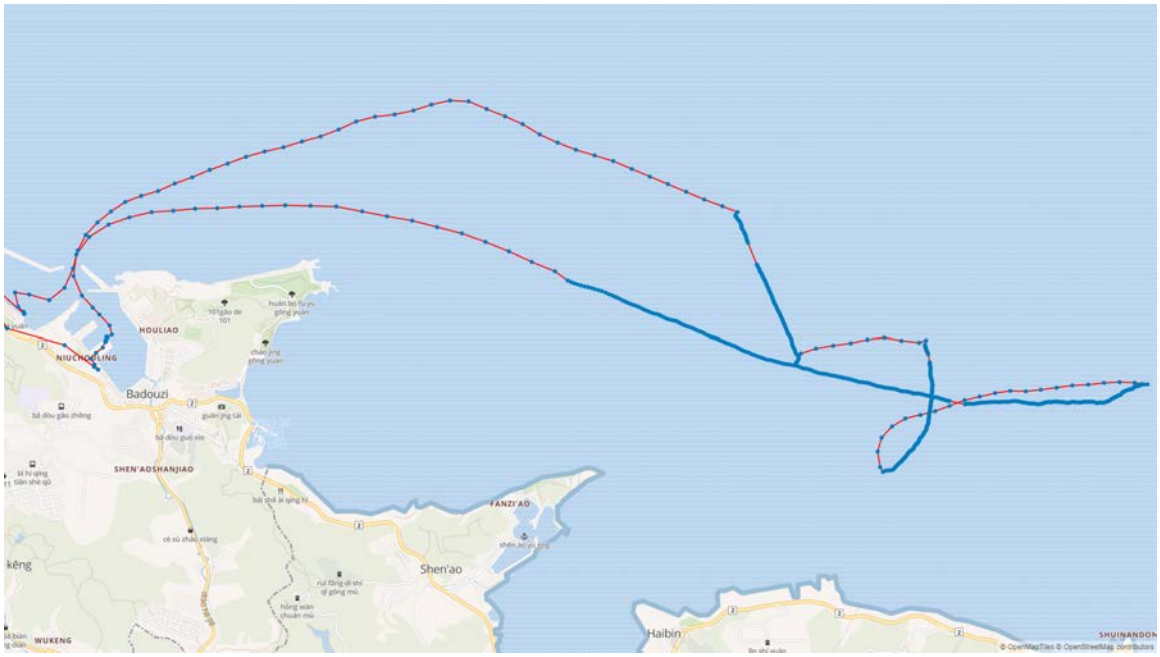

Figure 7: **The trajectory of the vessel can be analyzed and used for scientific studies.** Fishing activities can be analyzed from trajectories. In this experiment run, it can be easily identified where the group has been fishing.

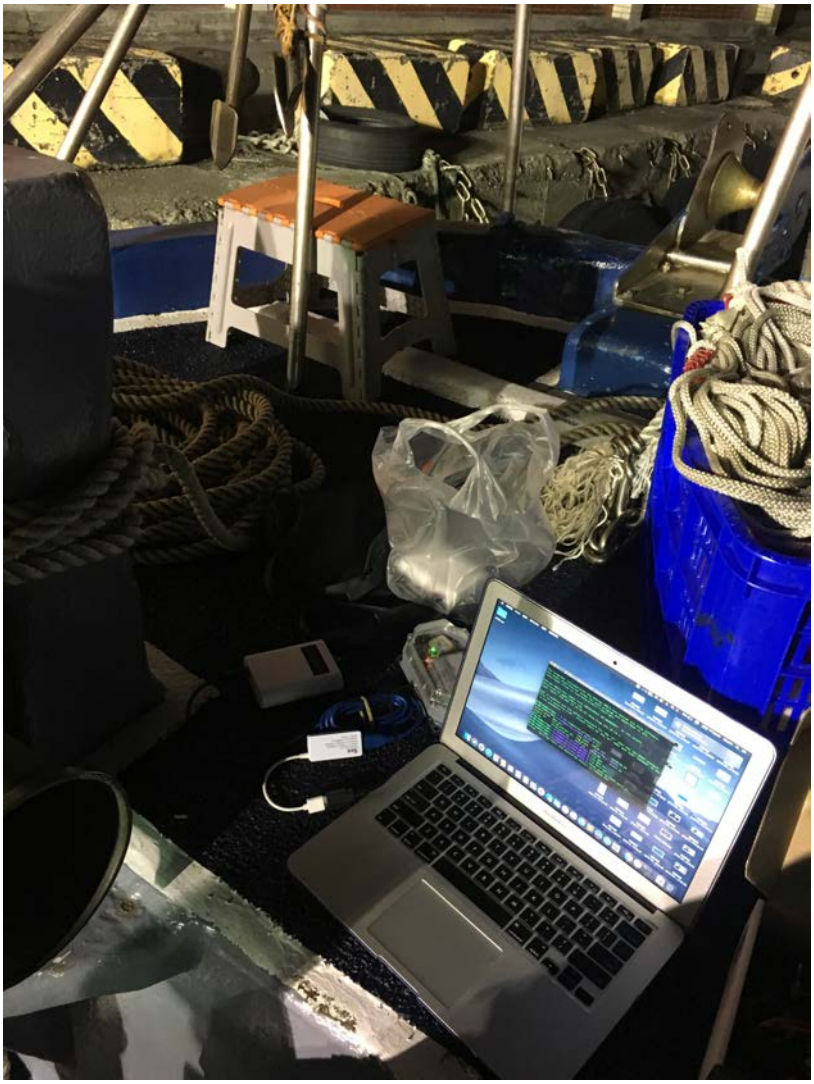

Figure 8: **Final setup of the i-Fish device.** Final checking of the i-Fish device before departure. The i-Fish can be managed from distant machines when it is connected to GSM networks or can be managed locally either by WIFI or direct cable connection.

Figure 9: **Testing i-Fish.** The device is placed at the bow of the vessel close to the starboard side. The waves can crash onto the fishing vessel and soak the device.

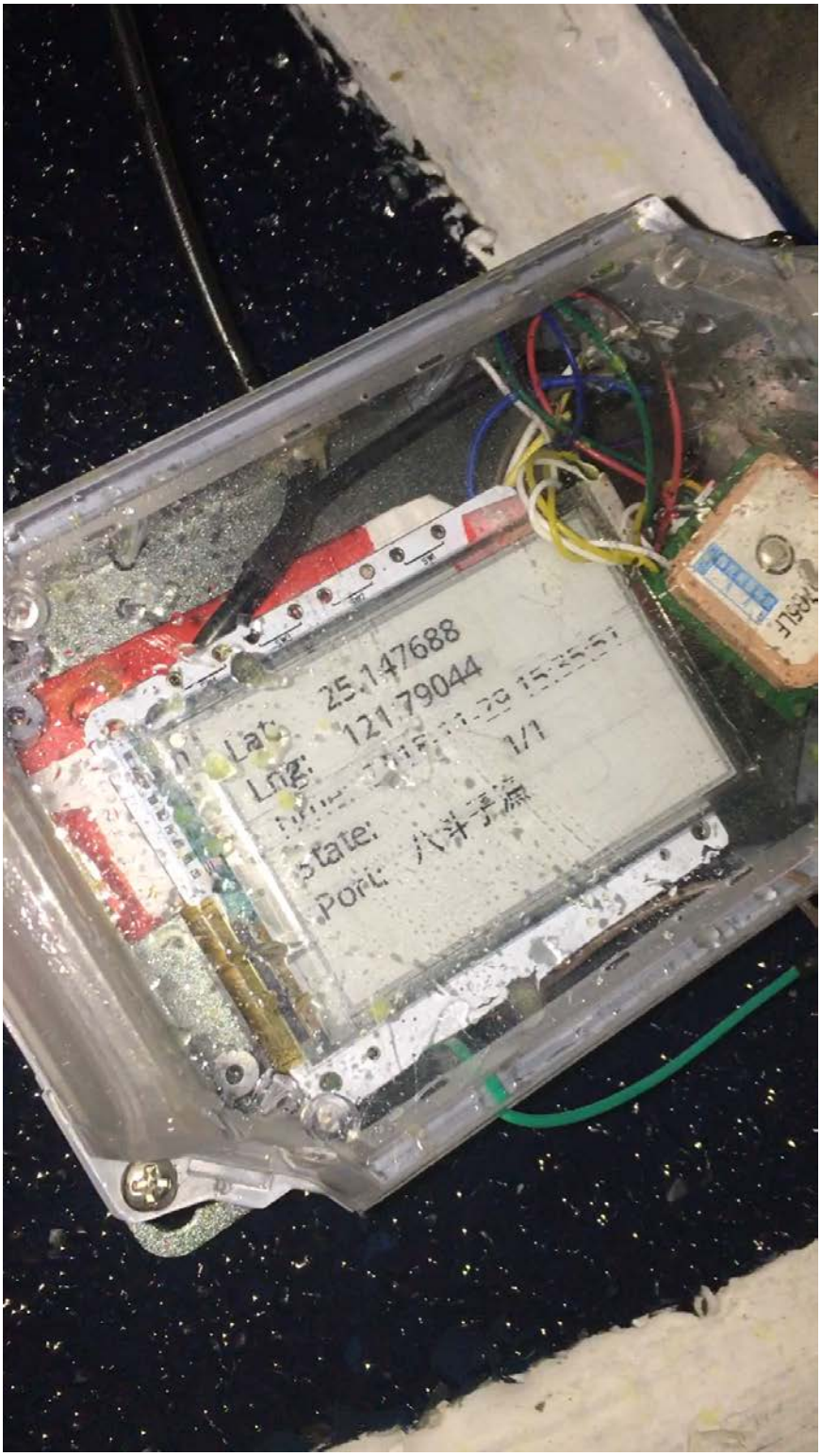

Figure 10: **Detecting port of the current position.** i-Fish is capable of detecting which port the vessel is in and if the vessel is in MPAs or not.

Figure 11: **Emergency alert.** By pressing the emergency button on the i-Fish device, the central monitoring system will show a big notification showing information of the vessel that sent the distress call.

Figure 12: **Extra trophy from the test run.** The team has also caught 34 largehead hairtails during the 5 hour run.