Location Sharing System Using AIS and RADAR TT Information on Cloud Server

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Introduction/Background

A collision in the Ondo strait at 2014/12/18

A 635 GT Cargo Ship (AIS ship) collided with a 20GT fisher boat (non-AIS ship).

Two people died.
Introduction/Background

• Demands to reduce marine accidents
  • Information supports for sharing ships’ position information including non-AIS ships are demanded.

• Demands to get non-AIS ships’ position information

• Development of Location Sharing System for ships (AIS and non-AIS ships) on cloud server
Last Year Presentation

• using Smartphone/tablet GPS position on Maritime Cloud
Idea for detecting non-AIS ships

Distribute the own location information by ships

• (1.1) AIS for all ships
  – Including Class B AIS Cost/Benefit ?

• (1.2) Other than AIS
  – e.g. Smartphone/tablet GPS information (last year)

Detection by outer sensors

• (2.1) Image Processing Technology

• (2.2) Using onboard (and shore) RADAR TT information

Integration: AIS and non-AIS on Cloud Server
RADAR TTM (Target Track Message)

- Most ships equip with RADAR
- RATTM sentence is TT information by RADAR

Data associated with a tracked target relative to own ship’s position.

```
$--TTM, xx, xx, xx, a, xx, xx, a, xx, xx, a, c--c, a, a, hhmmss.ss, a *hh<CR><LF>
```

- Type of acquisition
  - A = Automatic
  - M = manual
  - R = reported
- Time of data (UTC)
- Reference target (see Note 2) = R, null otherwise
- Target status (see Note 1)
- Target name
- Speed/distance units, K/N/S
- Target course, degrees true/relative (T/R)
- Target speed
- Target number, 00 to 99
- Bearing from own ship, degrees true/relative (T/R)
- Distance of closest-point-of-approach
- Target distance from own ship

- RATTM is relative information to own ship’s position
- RATTM should be exchanged to absolute information
RADAR TLL
(Target Latitude and Longitude)

- RATLL

Target number, name, position and time tag for use in systems tracking targets.

```
$--TLL, xx, IIII.II, a, yyyy.yy, a, c--c, hhmmss.ss, a, a*hh<CR><LF>
```

- **Reference target (see Note 2)**
  - = R, null otherwise

- **Target status (see Note 1)**

- **UTC of data**

- **Target name**

- **Target latitude, N/S**

- **Target longitude, E/W**

- **Target number 00 – 99**
System Architecture (Test bed)

Cloud Server (similar to Maritime Cloud)

Merge and integrate AIS and TT information

Draw on the ENC (jpg, raster image)

Send by 4G Router
AIVDO / AIVDM
RATTM / RATLL
GPRMC / GPHDT

Distribution by http. Using Web browser. Any device can be viewer.
System Architecture (Test bed)

Shore RADAR
AIS Receiver

Training Ship
RADAR
AIS

Ferry RADAR AIS

Merge and integrate AIS and TT information

Draw on the ENC (jpg, raster image)

Cloud Server (similar to Maritime Cloud)

Send by 4G Router
AIVDO / AIVDM
RATTM / RATLL
GPRMC / GPHDT
System Architecture of the System (Test bed)

Distribution by http. Using Web browser. Any device can be viewer.

- PC
- iPad
- iPhone
- Android
- …
Detection by RADAR
Non-AIS Shps
Detection by RADAR
Ferry
View via http
Shore RADAR
example
Characteristics, Advantage/Disadvantage of the System

- Most of the ships equip RADAR, GPS and COMPASS. No more additional navigational equipment. (4G/3G Router is needed)
- Recognize non-AIS ships position detected by other ships.
- Distributing raster image (jpg), not getting the detail information, but protecting the privacy information.
- When zooming up, low resolution, but Image data size is almost constant.
- Distributing by http, any device can be viewer. (Windows, iPad, iPhone, Android, Linux...)
- Monitoring System onshore
- Sharing the all Ships’ TT information, this system has a great advantage.
Summary/Conclusion

• Developed Location Sharing System for ships
  – Using onboard (and onshore) RADAR TT information
  – Using Cloud server (similar to maritime cloud)
  – No more additional navigational equipment
  – TT information (RATTM; relative information) was exchanged to absolute information (Latitude and Longitude)
  – Recognize non-AIS ships position detected by other ships’ RADAR.
  – Sharing the all Ships’ TT information, this system has a great advantage.
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