Mobile Geographic Visualization Service for Marine Safety Information based on Geo-Location Based Augmented Reality

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Abstract:

Marine leisure sports activities such as sea fishing, skin scuba diving and yacht sailing are affected by sea conditions such as waves and tides, and weather conditions, as well as by marine traffic. Timely provision of such high accuracy maritime information is very important because that affects the safety of people engaged in leisure activities. Safety information for marine leisure activities includes obstacle information such as the position of other ships and sea reefs and rocks in the vicinity, weather conditions. If marine leisure activists can identify and use various safety-related information around them, it will be a great help to carry out safe marine leisure activities. The geographic visualization environment provides users with the ability to intuitively and easily convey complex information. Therefore, mobile location-based services based on geographical visualization utilizing complex maritime safety information have the advantage of effectively providing the information necessary for people engaged in safe marine leisure activities.

In this study, we developed a location-based mobile application based on geographic visualization that support safe marine leisure activities by integrating ship navigation information, marine chart(map), and ocean weather information. The mobile geographical visualization service has a function to effectively integrate various type of data related to marine safety and transmit the fused information to users in order to support safe leisure activities. First, location of ships around the user's location is transmitted from AIS server and displayed on the map. Since the ship type, speed, and direction information are displayed on the map, the user can check the position of the ships operating in the vicinity. Second, since the ocean weather information such as wave, current, temperature, wind speed is received from the server and displayed on the map, the safety can be grasped by using the ocean condition and weather information in real time. The integrated marine safety information is visualized in mobile devicess in two ways. The first method is in which graphs, icons, and images are displayed on a two-dimensional marine chart(map). The second scheme utilizes a location based Augmented Reality(AR) technique. If the user directs the camera of the mobile device to a certain direction or point, safety information of the point can be expressed on the device. For example, when the user directs the camera of the mobile phone to a ship in the vicinity, information on the speed, moving direction, and type of the ship can be displayed on the mobile phone.
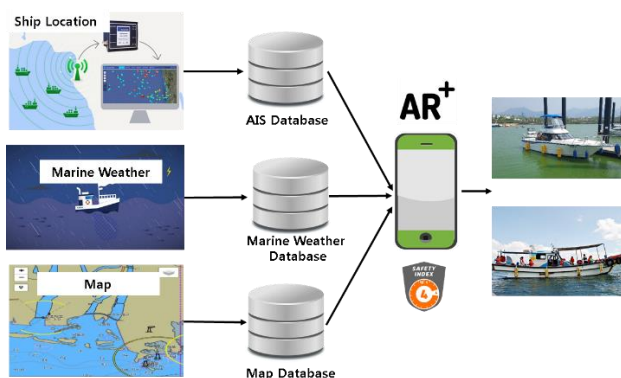
Figure 1. System architecture

The contributions of this study are as follows. First, we proposed a novel method to visualize various location-based maritime safety information on mobile devices. Map information of marine charts, weather information expressed in graphic format, and vessel information represented by icons are effectively fused and visualized on the limited display of mobile devices. Second, information transmission channel is diversified by integrating marine safety information by 2D maps and location based AR. The user can utilize either of the 2D maps or 3D AR by the purpose and the kind of the safety information. To build an environment that can consistently convey the same marine safety information in 2D maps and 3D AR remains as a challenge to extend the application of this study for the future.