IDENTIFICATION SYSTEM, TRACKING AND SUPPORT FOR VESSELS ON RIVERS

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Abstract: *According to the program COMPRIS (Consortium Operational Management Platform River Information Services), AIS (Automatic Identification System), RIS (River Information Services) have compiled a reference model based on the perspective of navigation on the river with related information services. This paper presents a tracking and monitoring surveillance system necessary for assistance of each ship sailing in an area of interest. It shows the operating principle of the composition and role of each equipment. Transferring data to traffic monitoring authority is part of this work.*

Keywords: Automatic Identification System, informational architecture

1. INTRODUCTION

The system is located on a floating buoy placed in fixed point of sailing, along the river. The buoy is equipped with an electricity generator which is driven by water that flow above the buoy system. The distance for system positioning is at 1 to 1.5 m above the water. On each ship entering the river is attached a device fitted on the ship castle, which constitutes a part of the identification system, the other part being mounted on the floating buoy. The equipment mounted on the ship consists of: fixed frequency transmitter (F1); fixed receiver (F1); GSM telephone system GSM dial preset number; identification data storage system of the ship. The equipment that is mounted on the buoy is composed of: receiver on fixed frequency F2; F2 frequency transmitter; GSM receiver system; data storage system received. All the ships that enters in the area of maritime navigation of the river, will have installed on board identification system, a system that will be delivered back when the ships will leave the river route. Mounted and electrically powered system on the ship will emit every 10 seconds a fixed frequency radio signal lasting 1 second. Buoys, positioned on the river and anchored in fixed, predetermined, will receive at near each ship F1 fixed frequency emitted by ship via fixed frequency receiver F1.In equipment situated in Beacon, reception frequency F1 will automatically trigger the transmitter Fixed F2. The signal will be issued via radio frequency generator F2 fixed for 1 second. Issue frequency F2 is practical "query ship" order when the reception frequency F2 via fixed frequency receiver on board, it automatically switches to GSM telephone system with fixed number dialing, calling GSM receiver located on the buoy system. This creates a communication path beacon ship on a GSM communication support. When calling GSM handset located on the buoy, it triggers "dialogue" scheduled between the two GSM units located on the ship and buoy.

This communication has scheduled the following steps:

1. Calling GSM handset located on the buoy, set by the GSM system on the ship;
2. Making support GSM communication link between ship and buoy;
3. Automatic calculation of the GSM handset located on the beacon, the communication menu contains the next options:
    a. Reception of ship data identification;
    b. Emission data stored in memory storage vessels registered in time.
4. Selection of identification data reception menu;
5. Reception and storing with date and time ship data identification;
6. Closing communications sessions.

Operation of GSM handset menu transmitted by the beacon is located on selecting options, through simulation, using software that calls this receptor system.

For "receiving ship identification data" it is created in the existing software in the GSM system on board, the option for signal generating. For achieving the communication link between ship and buoy, on GSM system software are scheduled the following steps:

- GSM desk phone call;
- Open communication path is done after pressing the button "Open communication";
- Issuing "Operating menu" at about 3 ms from achieving communication;
- Receiving the option of "ship identification data reception" from GSM terminal located on the ship;
- Transfer of data regarding the vessel identification;
- Closing communication

Memory storage registration of the traffic allows 9,999 recordings. A record contains: date and time; name of the vessel / flag; GRT / NRT; draft.

2. DATA TRANSFER TO TRAFFIC MONITORING AUTHORITY

The data recorded, in the memory of the device located on the buoy, can be reviewed and transferred to a database of traffic monitoring authority [8, 9, 11]. By calling the GSM system from the buoy it is made the necessary GSM communication support for data transfer. After opening the communication line, GSM transmit from the buoy an operation menu. Automatic Identification System provides data that can be displayed on a compact display or any compatible display device. The compact display cannot show further more than three data lines: the direction, distance and name of a selected ship.

This system can be used for: fleet and transport management of goods by water; tracking the vessel route on the river; displacement assistance; security control of the vessel; crew security control; emergency assistance, and can provide the following functions: voice communications, SMS, CS Data, GPRS TCP / UP; remote configuration; real time response; password protection system; SIM card PIN protection; setting phone use; ID setup for the unit of work; power management; alarm for lack voltage; the movement speed alarm in case of exceeding or decreasing it when it is imposed; 8 inputs channels for alarm; 2 analogic inputs channels for detecting the voltage 0-30Vcc; ship position control on the river; 8 outputs channels for control; 40,000 records; download the journal report via wireless; NEMEA-

0183 output protocol for data navigation; report distance traveled; daily report.

The system has the following characteristics: size: 16.5 cm x 9.5 cm x 3.9 cm; weight: 0.38 Kg (without accessories); GPS receiver: 12 channels; GPS active antenna; Update Rate: 1 Hz; Precision: 1-15 m; Datum: WGS-84; Power: 9-30 VDC; Current intensity less than 80mA at 12V (standby mode); less than 20mA at 12V (sleep mode); Operating temperature: -25 C to + 75 ° C (without battery backup); Storage temperature: -40 C to + 90 C; Integrated memory: 2 MB Flash memory; input ports: two digital inputs triggered positive - 6 digital inputs negative triggered - 2 analog inputs (voltage 0 - 30 VDC); output ports: 3 digital outputs triggered positive, 300mA max, 4 digital outputs negative 12Vcc- triggered, max 300mA, 12V DC-1 digital output triggered negative, max 10A, 12Vdc; Serial Ports: -Connector "father" DB9 (RS232) - baud rate: 57600 bps; default -Connector phone jack (RJ59) - baud rate: 57600 bps default.

Activities performed by the system:

1. **The charts management**:- a. charts loading - b. charts change,

2. Ship settings: –a. ship settings contains information about the ship's captain
-b. information setting

3. Communication setting. Port communication setting; direct connection; connection via GSM/SMS or GSM CS Data-Connection via GPRS-connection via GPRS with voice option.**Com Port:** Select the communication port that will be connected to the GSM modem.

Baud Rate: Selects 9.600 bps;**SMS Service Center:** If you select the GSM SMS should be entered phone number of SMS center used by the mobile operator;**Pine Code:** Insert the SIM card PIN code entered in GSM modem that connects to the unit; **Time out:** The time for waiting for a reply from the unit.

4. Obtaining the position. The program will send a command to the ship, and the unit will send back its position the. This will be the current position or the last position if the ship is not in GSM and GPS coverage area. When the ship unit will transmit the report, the information will be displayed in the information window.

5. Tracking. The program will send a command to the ship, so the unit will send the base unit through one of the functions of the position "Time Mode", Distance Mode 'or' IntelliTrack Mode ".

Time Mode: The unit will send the position according to the desired time. The time is specified in seconds and can be a natural number of between 15 and 65,535 seconds.

Distance Mode: The unit will send the position according to desired travel range. The distance is specified in meters and can be an integer in the range from 15 to 65,535 meters.

IntelliTrack: The program will begin monitoring unit will be set when both intervals (time and distance).

Continued Tracking: Execute the command until monitoring unit will first ship command "Stop Tracking".

Times: The "Tracking" number of commands to perform. For example, it was set number 5, the program will stop after 5 monitoring times. The monitoring program of the ship will send one message to vessel depending on the number of launched commands from the ship. When the unit will send the report information all data will be displayed in the information window. When the ship is monitored, the vessel name will become blue color.

6. Setting records: You can enable this function to ship's position.

Connect Type: Select "Direct Connection" or "Wireless" to upload parameters to the ship unit.

Com Port: Select the communication port of the computer.

Start Log: Activate the start of recording on the ship.

Stop Log: Termination of registration.

Clear Log: Deleting recorded data stored in memory.

Time: The unit will start recording according to the timeframe requested. Time is expressed in seconds, in the range of 15 to 65535 seconds.

Distance: The unit will start recording based on the range of movement required. The distance is expressed in meters and can be in range from 15 to 65,535 meters.

IntelliTrack: A recording position according to the algorithm selected is sent to the application. These algorithms are used to minimize the volume of data sent by the program to obtain more accurate information on the chart.

Times: Frequency. The range is 0-65535. If the selected number is 0, it means continuous monitoring.

7. Downloading records. There are two ways: the first is "Wireless downloading" and the other is: "Direct connection"

"**Wireless downloading**" is possible through GSM SMS, GSM and GPRS CS Date.

"**Direct Connection**": it uses RS232 data cable (PC to Unit).

Ignor Zero Speed: This will decide whether to delete the point where the speed is zero. There are three conditions that can cause speed value 0.

1: The unit that was set in motion only and did not receive the signal strength;

2: The unit is not moving;

3: Satellite signal is faulty;

Assuming that the unit has recorded several positions where it had the 0 speed, and this function is selected, the program will retain the first record in that speed was 0 and will ignore the others.

8. Output control. Select the name/number of the ship.

Output Control: Measurement time is 100 milliseconds. Example: if the setting is made in two seconds, you are given 20 values.

Output Toggle Times: The time from the current time to a fixed time and back.

The operator will change the output or input name. Once an input or output is required to a report and control center is required to immediately identify the situation.

9. Send messages. This is used for sending the MDT (Mobile Data Terminal) and to receive messages from MDT.

Program function is to get the current position of the vessel, monitoring the current position at any time, setting the necessary records and downloading them, sending the MDT and setting backup battery.

Distance Tool: Measuring a straight distance between two points

Select position: Viewing a specified locations of previous registration

Select communication port: Setting an appropriate type of communication and port number.

Vehicle setup: Recording information about the ship, such as captain name, name / number of ship, etc.

Get position: Obtaining the position about a particular vessel.

Start Tracking: Setting the parameters for monitoring and authorizing ship monitoring function.

Stop Tracking: Cancelling ship monitoring.

Unit Disconnect: End the connection between the base unit and ship using communication function GSM CS Date.

Output Control: Setting information output to a registered ship with TRACER program.

Setup logging: Set parameters for the information recording function.

Download logs: Setting parameters for the downloaded information function.

Upload: upload a modified configuration for a specific ship using GSM or GPRS.

Send message: Sending a message using the MDT to ship TRACER.

Voice Wiretap: Used for monitoring discussions inside the vessel in the event of unanticipated events.

Battery Setup: Closing or opening the backup battery.

Command line: Used to send a ST command to the ship.

Print: Printing current chart displayed on the screen.

About: Provides information about the TRACER program. The display provides information about the ship captain, reports events in real time and communication between ship and base unit.

Shortcut menu dialog: select a ship and through a window is displayed chart and locate the ship's position on the chart.

Longitude and Latitude: X & Y coordinates of the ship.

Get position: Getting your position about a particular vessel.

Start Tracking: Setting the parameters for monitoring and authorizing ship monitoring function.

Stop Tracking: Cancelling vessel monitoring.

Unit Disconnect: End the connection between the base unit and ship.

Vehicle setup: Recording information about the ship, such as commandant name, name / number of ship, etc.

Output Control: Setting the output information recorded.

Download log: Download information in flash memory unit on the ship.

Logging Setup: Set parameters for registration.

Send message: Sending a message from base unit by the ship.

Voice Wiretap: Used for monitoring discussions inside the vessel in the event of unanticipated events.

Modify: Changing information regarding the ship or captain.

Speed Range Color: Use different colors to indicate cruising speeds.

Preference: Change measurement unit between "km" and "mile".

Record Track: If this option is selected, it will record the ship's route.

Show Track: The program will show oldest routes of the ship to current one on the chart.

Single Map: It will display all vessels on one map.

3. CONCLUSIONS

This paper presents a reference model containing:

- An architectural organization which defines linking models for navigation components, for use and functioning on the river; set objectives and goals for strengthening the river navigation safety;
- Informational architecture, where the exchange of information, with the cooperation of all which are exploiting and using the waterway, to perform in good condition;
- The functional architecture of existing features to be fulfilled in reality. These functions should be performed according to a plan that should ensure the autonomy of the navigation on the Danube;
- The data architecture based on a developed concept will show how identification messages are composing, rules imposed in every area of navigation, rules of entry, standing and departure from ports, cruising speeds on every zones, restrictions and the equipment of the ships;
- The physical architecture describes how the features of the functional architecture of a system can be allocated;
- The architecture of a communication that is making the connection between data and information on one hand and on the other hand standardizes the message.

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