

RECOMMENDATION ITU-R M.1307

**AUTOMATIC DETERMINATION OF LOCATION AND GUIDANCE
IN THE LAND MOBILE SERVICES**

(Question ITU-R 51/8)

(1997)

Summary

The ability to automatically determine location and to provide guidance has become increasingly important over at least the last decade and a half. This trend is likely to continue, if not accelerate, in the land mobile services. Further, various automatic determination of location and guidance (ADLG) techniques promise to play a major role in the Transport Information and Control System (TICS). This Recommendation presents a general overview of ADLG as well as technical information and examples of existing systems.

The ITU Radiocommunication Assembly,

considering

- a) that automatic determination of location (ADL) will become an important part of many types of land mobile systems, particularly, but not limited to, dispatch systems and public safety systems; and other types of systems such as tracking of objects or wildlife, and search and rescue;
- b) that the introduction of ADL into dispatch type systems can potentially improve spectrum utilization efficiency of communications channels due to reduction in voice traffic related to location and routine information;
- c) that one of the most critical elements in dispatch service is the knowledge of current accurate location of every unit in the operational fleet;
- d) that costs of running land mobile dispatch operations are increasing;
- e) that a considerable part of the voice communications on a radio dispatch channel is location and other routine messages;
- f) that ADL integrated with a land mobile radio dispatch system can potentially reduce the cost of dispatch operations;
- g) that accurate information on the location of units in a public safety operation can increase the potential of saving lives and protecting property;
- h) that ADL techniques may be of great value for non-dispatch type systems which involve tracking the location of an object;
- j) that ADL may be used to locate people or vehicles travelling off-road routes or in wilderness, particularly in distress situations;
- k) that within the land mobile service there is growing demand for guidance systems;
- l) that both ADL and guidance systems may use the same basic techniques for location;
- m) that guidance systems can potentially reduce journey costs and improve road safety;
- n) that both ADL and guidance techniques may be key elements of Transport Information and Control System (TICS),

recommends

- 1 that ADL include the determination of location of all animate and inanimate objects, and messaging associated with the location or monitoring of the given object. Such messaging may consist of voice or non-voice communications necessary to provide accurate, timely and complete status and instructional information relating to the object (or vehicle) being located or its occupants;

- 2 that interconnection with the public switched telephone network (PSTN) be limited to store and forward type operations;
- 3 that the following broad operational requirements be considered when implementing ADL in the land mobile service.

3.1 Positional accuracy

For many services, accuracy to be provided is of the order of 100 m. In the public safety service, such as police, accuracy of the order of 10 m may be required. For other users (e.g. large area trucking and similar dispatch), an accuracy of about 1 km could be adequate. When systems such as tag readers are employed, as in bus and train routes, accuracy of 1 m may be achieved.

3.2 Updating position

The frequency of position update transmissions will depend on the specific application. For vehicles requiring quick deployment in limited areas (e.g. police, fire tenders, ambulances), a frequency of updating of approximately once per minute may be necessary. For dispatch operations over larger areas or defined routes (e.g. trucking, omnibuses, taxi, trains, or wildlife tracking), much less frequent updating is required.

3.3 Coverage area

For many systems (e.g. police, fire, ambulance, passenger omnibus, taxi) operational areas up to 100 km × 100 km are common. Some operations are confined to much smaller areas of up to 10 km²; others may require national or regional coverage;

- 4 that ADL systems should be used to achieve the following benefits:

4.1 In fixed route operations:

- reduction in checking and control personnel;
- more even distribution of passengers between vehicles;
- reduction in lay-over time resulting in reduction in number of vehicles and personnel;
- improved on-time service;
- improved efficiency of response during emergency and dispatching a replacement vehicle;
- increased passenger loads due to more convenient and up-to-date location information being available to the public;
- economic benefits accruing from improved fuel efficiency and all of the improvements listed above;

4.2 In random route operations:

- reduction in response time to emergency and service calls;
- reduction in the number of vehicles while maintaining the same coverage area;
- reduction of unnecessary travel;
- economic benefits accruing from the above;
- possible improved chances of success in search and rescue operations at remote locations;

4.3 In other types of operations:

- scientific uses such as wildlife tracking;
- location of stolen vehicles;
- increased efficiency of certain manufacturing processes, such as assembly line quality control;

- 5 that ADL systems should be used to improve spectrum utilization efficiency by reducing or eliminating the need for voice communication to provide location information;

6 that the following ADL techniques could be used in the land mobile services:

6.1 Multilateration systems:

- hyperbolic,
- Global Navigation Satellite System (GNSS),
- differential-GNSS;

6.2 Non-multilateration systems:

- proximity,
- dead reckoning,
- satellite,
- homing beacons,
- combinations of the above;

6.3 Combinations of multilateration and non-multilateration systems;

6.4 Links:

- a forward link is any signal transmitted to a mobile unit to be located by a multilateration system,
- a reverse link is a multilateration signal transmitted to the fixed or base station,
- a communication link is used for two-way messaging in multilateration systems.

A brief description of each ADL technique is given at Annex 1;

7 that the following navigation systems could be used within land mobile service application:

- GNSS (Global positioning system (GPS), GLONASS, etc.);
- Loran-C;

8 that examples of parameters which may be useful for international standardization, can be found in the examples of three such systems given in Appendices 1, 2 and 3;

9 that guidance systems can provide savings of journey costs by reducing travel time;

10 that the following guidance systems could be used in the land mobile services:

- autonomous systems,
- infrastructure supported systems,
- dual mode systems,
- a brief description of each is given at Annex 2;

11 that frequency bands which could be used in automatic determination of location and guidance (ADLG) in the land mobile services would be found within the bands allocated to radiolocation and mobile as necessary for specific uses described in Annexes 1 and 2.