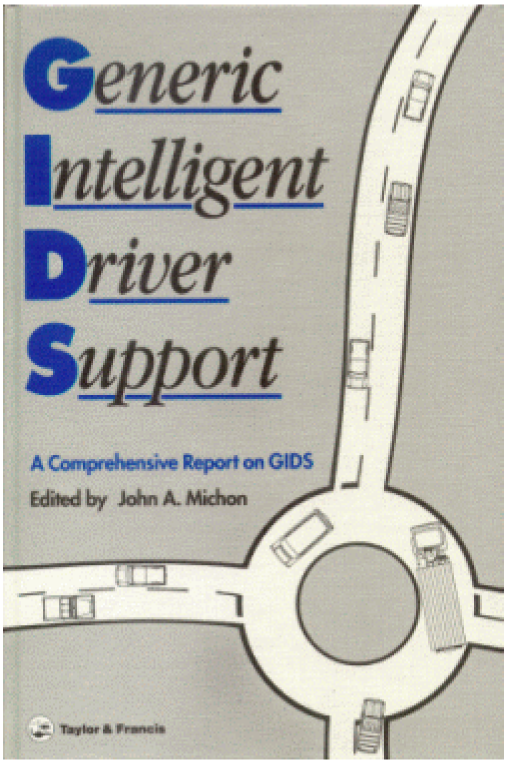
GIDS:
Generic Intelligent Driver Support



Background

Driver support systems offer information and advice to motorists. Some such systems may even take action under circumstances that surpass the mental or physical capabilities of the human driver. These systems are becoming increasingly sophisticated and affordable. Despite the progress that is being made with the development of driver support technology, and despite the eagerness of manufacturers to launch their products and the eagerness of customers to have these products installed, the present level of sophistication does not entail much in terms of design ergonomics and functional intelligence.

Almost fifteen years ago a consortium of 13 European research institutes and industrial companies completed a large study, under the title *Generic Intelligent Driver Support*—or GIDS for short—as part of the European Commission's DRIVE Programme. The stated objectives of the GIDS Project were:

- to define detailed functional requirements of generic driver support systems;
- to determine the impact of such a system on the task representations and behaviours of drivers with respect to planning, manoeuvring, and handling aspects of the driver task;
- to determine the interactive communication (display and dialogue) between the driver and such a system, inclusive of adaptive feedback;
- to develop the required hardware and software for a properly functioning prototype GIDS-system;
- to determine the impact of systems that meet the GIDS specifications on safety, efficiency, training and system acceptance;
- to demonstrate the validity of the GIDS concept in field tests.

These objectives were largely met and the results have been described in: **John A. Michon (Editor), *Generic Intelligent Driver Support: A comprehensive report on GIDS*. London and Washington DC: Taylor & Francis.** The i ntroductory chapter to this comprehensive report follows below.

The management of the DRIVE Programme and the Evaluation Panel reviewing the achievements of the GIDS Project concluded in 1992 that the project had successfully met its objectives. As a serious critical note, however, these authorities obeserved that the project may have been (too) far ahead of its time.

I frequently disagree with authorities, but in this case they may well have been right. In my opinion the present level of theory and technological conceptualization of *driver support* is still lagging far behind the integrative concepts that were central to the GIDS Project. This does not imply that the discussion about these concepts has stopped altogether; on the contrary! It just means that for those presently active in this domain heeding the results of the GIDS study might still pay off.

Since the book is still in print, it may help to get the taste of its philosophy and contents by reading the first chapter and by glancing over the table of contents, both of which follows below on this web page.

From: John A. Michon (Editor), *Generic Intelligent Driver Support: A comprehensive report on GIDS* (pp. 3-18)
London and Washington DC: Taylor & Francis

[p. 3]

Chapter 1
Introduction: A guide to GIDS

John A. Michon and Alison Smiley

1.0 Chapter outline

In this introductory chapter an overview is presented of the nature and development of GIDS, the *Generic Intelligent Driver Support* system. The development of GIDS took place between 1989 and the middle of 1992, as part of the EEC DRIVE programme. The present volume, summarizing the activities of the GIDS Consortium, was prepared at the conclusion of the project.

An overview of an intelligent, or adaptive, driver support system is presented in Section 1.1. Next the objectives (Section 1.2) and some historical background (Section 1.3) of the GIDS project are provided. The position of GIDS within the larger framework of Road Transport Informatics (RTI) is reviewed in Section 1.4.

The next four sections present the GIDS perspective on driver support. In Section 1.5 we outline the domain that is covered by the GIDS concept and the constraints that had to be imposed to keep the project within practical limits. In Section 1.6 we review the functional characteristics of the GIDS system, and Section 1.7 is devoted to the way in which GIDS has been implemented.

Finally, in Section 1.8 a brief preview of the subsequent chapters of this book is presented.

1.1 What is GIDS?

Introduction

The overall objective of the GIDS project has been “to determine the requirements and design standards for a class of intelligent co-driver (GIDS) systems that are maximally consistent with the information requirements and performance capa**[4]**bilities of the human driver” (from the GIDS project proposal, GIDS, 1988). The project has resulted in recommendations for such systems and in a (limited) operational prototype demonstrating the essential features of the GIDS concept, both under simulated and real world traffic conditions. The GIDS project—officially known as DRIVE Project V1041 "Generic Intelligent Driver Support (GIDS)"—was part of the DRIVE Programme which was initiated in 1988 by the Commission of the European Communities to stimulate and coordinate the introduction of modern Road Transport Informatics (RTI). DRIVE stands for Dedicated Road Infrastructure for Vehicle safety in Europe.

Co-driver systems or driver support systems - the latter being the term to be used throughout this book - derive their usefulness to a large extent from the fact that vehicle operators must cope with a growing amount of information of an increasingly complex nature. This is caused by several factors, including increasing traffic density, an increasing number of on-board and roadside sources of information and, last but not least, by the increasing amount of additional in-vehicle equipment, such as telephones and fax machines. A driver support system, such as GIDS, will help to counter the information pollution that is threatening the vehicle operator, by filtering, interpreting, integrating, prioritizing, and presenting the information from any number of sensors and applications.

This avalanche of information - much of which will eventually be generated by RTI systems resulting from the DRIVE programme - is likely to have an impact on almost every aspect of the driving task. It will affect route planning as well as navigation, manoeuvring, and elementary vehicle control. Unless regulatory action is taken this information will eventually be presented to the driver in an essentially incoherent fashion, irrespective of its importance or appropriateness. A critical function of GIDS, as of any other driver support system, is to protect the driver from being overwhelmed by such uncoordinated information.

The innovative feature of GIDS is that it is the first system ever to take into account, in an adaptive fashion, (some of) the intentions, capabilities, and limitations of the individual driver. Driver support systems should enable drivers to cope with the driving task more easily, safely and efficiently (and, indirectly, at diminished cost to the environment).

By meeting its overall objective, the GIDS project will help to further the goals of the DRIVE programme which were: "to increase traffic safety, to improve transport efficiency, to reduce energy consumption and to improve the environment" (as stated in the DRIVE Call for Proposals, DRIVE, 1988).

A scenario

To obtain a feeling for what GIDS might eventually become, imagine you are travelling to Switzerland for a holiday in the Alps. Upon arrival your rental car is waiting for you at the airport. In order to get going, you simply insert your per**[5]**sonalized GIDS smart card in the receptacle on the dashboard. Instantly the vehicle will recognize who you are and adapt automatically to your individual needs and traits. It will know, say, that you have never driven on mountain roads before, and that you have a tendency to brake very briskly. Knowing these and other things, the GIDS system will be prepared to guide you slowly through hairpins and keep you far from those nasty 15^+ per cent descending stretches of mountain road, at least for the first couple of days.

Moreover, realizing that your knowledge of, say, French and Italian is marginal, it will translate all the local traffic information into your native language, including whatever there is to read on the various road signs.

The G, I, D, and S of GIDS

Whilst admitting that this is a somewhat far-fetched sketch of the performance of GIDS, let us now consider what GIDS is by looking more closely at the constituent concepts of the term.

The term *generic* refers to the fact that GIDS has been conceptualized in such a way that it may increase in scope and complexity with the development of new technological capabilities. The system as it figures in this volume covers a limited but realistic set of tasks, namely such tasks as can presently be defined unambiguously and for which equipment is currently feasible. GIDS is based on a communication protocol, that is, an agreed way of communication between the driver and the system. As a result the GIDS system and the external inputs to the system can be extended to accommodate subtasks and information sources that may be added later. In other words, GIDS is generic in the sense that it is not specific to the automation of particular driving tasks or rigidly defined categories of information.

GIDS contains *intelligence* of a kind that other current support systems do not. Ideally a GIDS system should be able to manage the stream of information to the driver in accordance with the driving task, the driving conditions, and the state the driver is in. Current support systems lack this type of intelligence. They do not select or integrate information according to the demands of the driving task or according to the state and intentions of the driver. Not only do conventional systems not select the appropriate level of detail, they also do not prevent the driver from selecting a level of detail that is inappropriate in the face of the current situation. With currently available technology drivers can be using a navigation system, talking on a cellular phone, and checking on their moment-to-moment fuel economy. The information from these multiple sources is not integrated in conventional systems and therefore unsafe situations may arise, due to overload or contradictory advice. GIDS is designed to prevent drivers from overloading themselves because it will integrate the available information from various sources, taking driver needs and intentions into account.**[6]**

In designing GIDS to support a variety of driving tasks, the physical, perceptual and cognitive characteristics of the *driver* needed consideration. This includes his or her physical capacities, perceptual capacities, and cognitive capacities. An important additional characteristic of the driver which, nevertheless, has not been explicitly considered in the GIDS project, is the driver’s emotional state. This deliberate omission has been an occasional source of criticism. After all, emotion is a powerful determinant of driving behaviour: a driver who is preoccupied with some stressful personal situation may be inattentive, and a driver who is feeling aggressive may speed, or overtake unsafely, and so on. However, only those aspects of emotional and motivational states that are observable, such as higher speeds, may be considered in a GIDS system, but thus far these aspects do not, unfortunately, provide unambiguous cues about the driver’s state.

GIDS provides support at three major levels defining the driving task: navigation, manoeuvring and control. Besides support at each of these levels, the GIDS system provides support on a “meta-level”. This is the area in which the GIDS concept differs most from conventional support systems.

First, information from individual support systems serving each of the three task levels is integrated and prioritized so that the system can respond appropriately to the driver’s current situation. This means that the mental workload of the driver is taken into account in the presentation of information.

Second, the GIDS system can provide adaptive feedback. This includes evaluation of prior performance, instructive feedback, and progressive modification of support structure. The latter refers to such possibilities as the system gradually giving less and less route information as the driver has more experience of a particular route, down to the point where only information about changed conditions, such as a new construction zone, is presented.

1.2 Practical objectives and core activities

The GIDS overall objective, stated in Section 1.1, is too abstract to offer much practical guidance. In more concrete terms, the GIDS consortium has pursued the following set of practical goals, as stated in the original GIDS proposal:

- define detailed functional requirements of generic intelligent driver support (GIDS) systems;
- determine the impact of new road transport informatics (RTI) systems on the task representations and behaviours of drivers with respect to navigation, manoeuvring, and control aspects of the driving task;
- determine the interactive communication (display and dialogue) between the driver and the new RTI systems, inclusive of adaptive feedback; **[7]**
- develop the required hardware and software that will lead to the implementation of a prototypical GIDS system. This prototype shall incorporate the substantive core of the GIDS concept;
- determine the impact of systems that meet the GIDS specifications on driving safety, efficiency, training, and system acceptance;
- demonstrate the validity of the GIDS concept in field tests.

These objectives have been pursued in two major stages. The first stage roughly covered the first 18 months of the project. It dealt with the specification of behavioural requirements and technical characteristics for a GIDS prototype of limited functionality. The second stage, initially intended to cover the period 1 July 1990 until 31 December 1991, but ultimately lasting until the middle of 1992, was devoted to the implementation and evaluation of this prototype.

We distinguish four major component activities that, together, have enabled the GIDS consortium to achieve the stated objectives according to plan.

The first activity consisted of a definition of the basic functional and operational requirements of GIDS systems. For this purpose several basic functional domains were distinguished. Altogether five such functional domains have been recognized as basically covering the whole domain of driving tasks: planning, manoeuvring, control, adaptive feedback instructions, and functional integration of non-driving activities, such as carrying on a telephone conversation while driving. Within each domain a characteristic application was then selected, allowing us to keep the size and complexity of the prototype within reasonable bounds whilst retaining the essentially generic nature of the GIDS concept.

The second activity was a critical examination of the functional and operational requirements of GIDS systems. For this purpose a series of preliminary studies - literature reviews and pilot experiments - were carried out early in the project. The results of these studies initially gave rise to a working definition of the GIDS concept and later to operational recommendations for GIDS systems in general and for the GIDS prototype in particular.

The results of the component studies were integrated into concrete design specifications, incorporating the substantive core of GIDS system functions and operations. These specifications guided the construction of the prototype GIDS system. Under the terms of the present project a prototype of limited functionality has become available, in two versions. The first is implemented in a genuine automobile for on-the-road studies, the second is part of a simulation facility. Further development is required before a reliable and practical driver support system that is economically feasible can eventually emerge.

Once the prototypes became available, field tests were carried out to measure the GIDS system's effectiveness and behavioural impact. This activity took up the final part of the last project year. The evaluation proceeded on the basis of hardware and software performance tests and on the basis of a functional evaluation by **[8]** testing predictions about driver performance and acceptance, with special concern for the criteria specified, viz. safety, efficiency, and instruction. This stage finally converged on a field demonstration which effectively concluded the GIDS project.

1.3 Origin and course of the project

The ultimate aim of GIDS was to provide a driver with adaptive intelligent support. For this we must be able to produce a formal description of a driver's behaviour to the extent that it can be understood by an artificial intelligence, a computational system. The question is, of course, how long models that qualified for this purpose had been around before the inception of GIDS. The answer is: Not very long!

Only by 1984, it seems, had the intelligence of cognitive architectures become flexible enough to support an effective formalization of the driving task (Michon, 1985). This led to a semi-serious proposal to develop the intelligence required for a robot driver which (or should we say who?) would be able to pass its driver's licence examination by the year 2000 (Michon, 1987). At the time this was a somewhat exalted and far-fetched idea which met with a good deal of disbelief.

Then an excellent opportunity arose to test the feasibility of this idea on a more modest and more realistic scale, when the Commission of the European Communities launched the DRIVE programme. Following a series of confusing consultations, a brainstorming session was held in the summer of 1988, involving representatives of the Traffic Research Centre RUG, the TNO Institute for Perception, and Philips Bedrijven NV. Eventually, early in October of the same year, a consortium of thirteen universities, industrial companies, and research institutes from six European countries combined forces and submitted a proposal to the DRIVE Commission (GIDS, 1988). The proposal was negotiated and accepted, and work began on 28 January 1989. The project was officially completed on 31 December 1991 although some of the work went on beyond this deadline. The final report was accepted by the European Commission on 17 October 1992.

The outline structure of the GIDS project as it has been carried out is schematically represented in Figure 1.1.

1.4 GIDS in the broader RTI context

Several aspects of the GIDS concept put the project in a central position in the wider context of RTI as studied under the DRIVE programme. The GIDS approach is generic in the sense that it is not, in principle, attached to domain-, task-, or equipment-specific requirements. This implies a kind of flexibility that should eventually facilitate its customization for a broad spectrum of dedicated RTI applications, both roadside- and vehicle-based. **[9]**

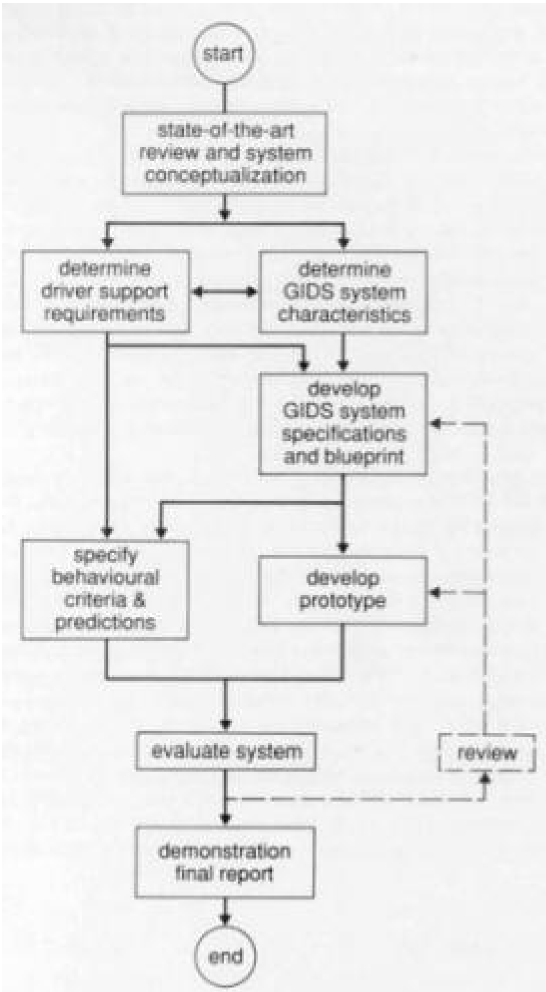


Figure 1.1 The main stages of the GIDS project

[10]Thus, at a later stage, GIDS should be able to play a role in the development of 'smart roads' and 'smart cars' alike. The integrative nature of the GIDS concept should help to provide multifunctional support to drivers in a variety of situations and thus will help to avoid the much dreaded information explosion in road traffic that might otherwise overwhelm and confuse drivers, and influence their performance adversely.

At this point we wish to emphasize the complementarity of the GIDS project with other, related programs. The GIDS project is special in the sense that it provides an essential link for improving the important human-machine interface; pursuing a systems approach that takes full account of the human component in the system. Related activities in DRIVE and, for that matter, the PROMETHEUS programme, do not similarly proceed from this perspective. One aim of the GIDS project has been to impose realistic and psychologically meaningful constraints to ensure that these activities will be user-centred rather than technology-driven. Such meaningful constraints should not in any way interfere with informed and user compatible technological or economic developments but, on the contrary, should support development by helping to avoid costly but unnecessary (useless or unacceptable) steps on the way to a large-scale implementation of road transport informatics.

The GIDS Project to be considered in this volume was subject to the inherent dynamics of the DRIVE programme. In this sense it has, undoubtedly, followed and even reinforced the trend towards the "informatization" of the traffic environment. It is appropriate at this point to sound two notes of warning. First, it should be emphasized that the introduction of GIDS systems has the potential to create a technology spiral. Effective driver support systems will enable the driver to cope with more and more complex information. This, in turn, may induce vehicle manufacturers, road administrators and the drivers themselves to expand and complicate the information delivered, which will call for more advanced driver support systems, and so on. Second, while GIDS systems certainly have the potential for achieving the DRIVE goals of increasing safety and efficiency of driving, through supporting drivers in particular tasks, there may be better ways of attaining the same goals. To take an example, it may be that building all the intelligence into individual systems in each car will be a more expensive and less effective means of maintaining lane position than building less intelligence into the car but adding to the road infrastructure instead, so that cars are automatically guided along high-speed roads.

1.5 The domain of GIDS

In GIDS, the question as to how intelligent driver support should be structured is stated in terms that are consistent with the present state of the art of road transport informatics **[11]** and behavioural science methodology. The complex and underdetermined informatics and behavioural science methodology. The complex and underdetermined nature of the driving task makes it impossible to take the entire domain into account. A selection therefore had to be made. The proposed constraints allow for a limited but, nevertheless realistic and important set of features:

(a) Environmental conditions
The driving circumstances have been integrated into a subset of the real world— the so called Small World—which allows a driver to negotiate typical road environments, including a roundabout, T-junctions, an intersection and curved roads (Figure 1.2). Also a limited set of environmental conditions has been specified for this Small World: there may, for instance, be certain obstacles (vehicles, trees, buildings), and visibility may be either high or low. The Small World has guided much of the GIDS research. As such it has proved to be a powerful methodological heuristic. It has reduced the computational complexity of the GIDS system to acceptable proportions; and it can be implemented in the real world, as well as in driving simulator studies and computer simulations.

(b) Subtasks of the driving task
The tasks studied have been geared to the constraints imposed by the Small World and include entering and exiting a roundabout, turning, merging, negotiating an intersection, curve tracking, car following, and overtaking. Together these form a small but important set of (sub)tasks for which a definite, closed, computational description can be given and which cover a considerable percentage of ordinary driving actions.

(c) Support functions
The support functions realized in the GIDS prototype derive from the aim to provide driver support at each of the principal levels at which road users must cope with their task: planning (navigation), manoeuvring (obstacle avoidance), and handling (steering and accelerator control). In addition the role of instructional feedback to novice drivers and the effect of some concurrent in-vehicle tasks not directly related to driving (carrying on a telephone conversation) have been studied.

(d) System architecture
Functionally the GIDS architecture consists of an analyst/planner, accepting inputs from a series of special-purpose applications (sensors), a repertoire of `situations', a data base containing information about the driver, and a dialogue controller. The hardware components of the system are integrated in a bus architecture allowing bidirectional communication between all components. **[12]**

(e) Presentation systems (human-machine interfacing)
The GIDS architecture allows drivers to interact with the GIDS system by means of a variety of displays and controls, including voice input and output, a keyboard and LCD display, switches, and active controls (steering wheel and accelerator).

(f) Driver characteristics
Finally the GIDS system is able to adapt to various states and traits of drivers. Initially a limited number of driver characteristics has been selected, in particular age and experience.

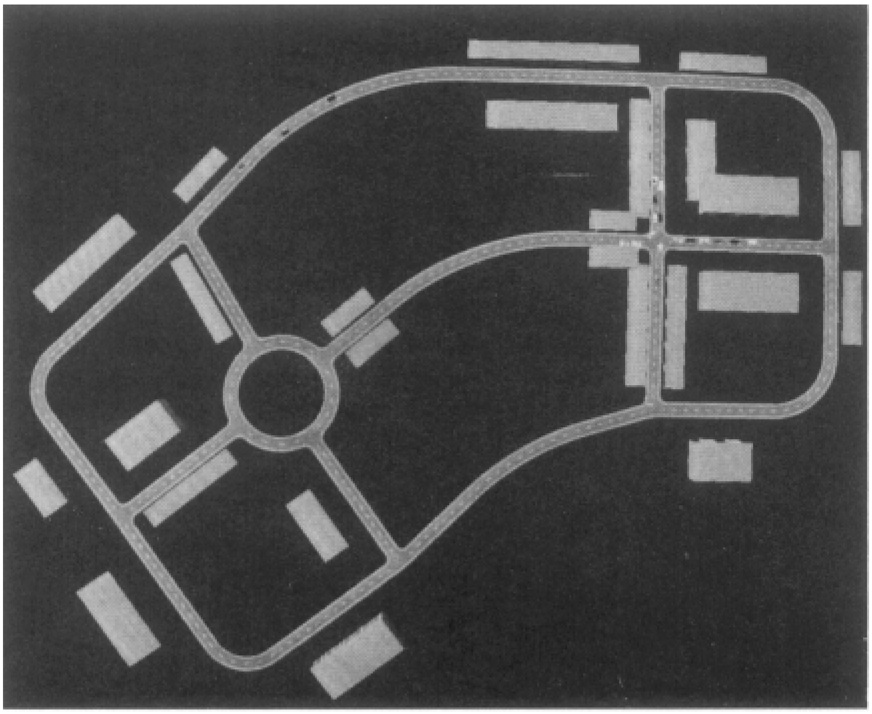


Figure 1.2 The Small World topography

1.6 The functional characteristics of GIDS

The GIDS system operates in the following way. It obtains its inputs from any number of low-level sensors and intermediate-level (dedicated) support systems or applications, such as a navigation system or a collision avoidance system, each of which provides messages with its own format and its own domain-sensitive content **[13]** or meaning. These front-end systems generate the GIDS system's knowledge about the world and thus provide the basis for the messages (warnings, advice, interventions) the system may subsequently decide to impart to the driver. Whether or not a particular message will be presented to the driver depends on the results of a comparison between the observed behaviour and the required behaviour, computed by the system, and on the driver's needs and intentions. It remains a matter for further study to determine to what extent and degree the GIDS architecture can explicitly and unambiguously infer these needs and intentions from its inputs: the limitations of the GIDS design cannot be defined in advance!

Once the driver's needs for support have been determined, the system will select from its knowledge repertoire a `scenario' that represents a particular (sub)task to meet this requirement. As long as the behaviour of the driver stays within the accepted range, no message will filter through; otherwise the system will allow the relevant messages to be communicated to the driver.

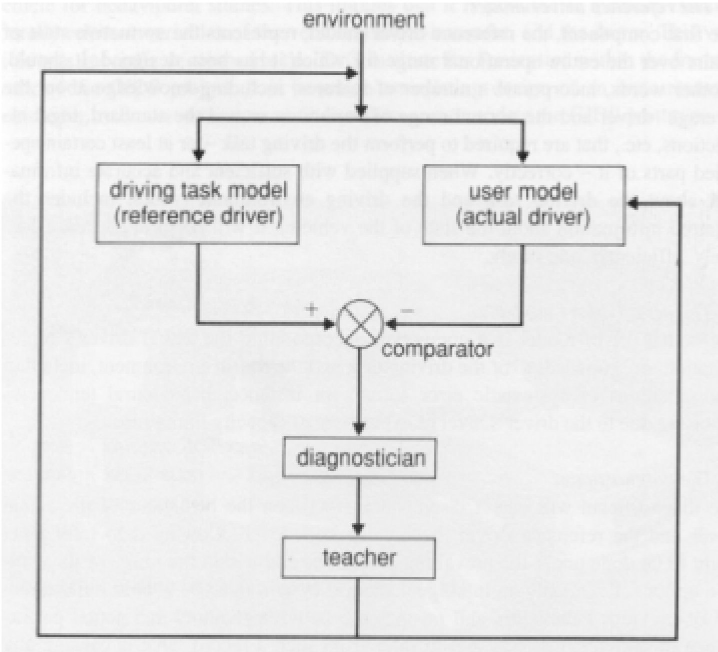


Figure 1.3 Conceptual model for GIDS

While this is the normal mode **[14]** of operation for the GIDS system, it will, in the meantime, continuously monitor the actual situation and allow priority interrupts whenever necessary.

The model on which the GIDS system is based contains four primitive elements (Figure 1.3). In later chapters we will expand this elementary scheme into the actual GIDS system. For the present, however, understanding is best served by referring to these four primitives since they are related rather directly to similar components that make up `intelligent tutoring systems' (e.g., Sleeman & Brown, 1982). Any adaptive support system must encompass these elements in one way or another.

(a) The reference driver model

The first component, the reference driver model, represents the normative state of affairs over the entire operational range for which it has been designed. It should, in other words, incorporate a number of features, including knowledge about the `average' driver and the normal range of variations around the standard, legal restrictions, etc., that are required to perform the driving task - or at least certain specified parts of it - correctly. When supplied with sufficient and accurate information about the driving task and the driving environment (which includes the required information about the state of the vehicle), it will perform its task effectively, efficiently, and safely.

(b) The actual driver model

The actual driver model is a component incorporating the actual driver's representation, or `knowledge' of the driving task and the traffic environment, including representations of systematic error forms; for instance, behavioural tendencies which are due to the driver's level of experience or capacity limitations.

(c) The diagnostician
The diagnostician will detect discrepancies between the behaviour of the actual driver and the reference driver. It contains knowledge allowing it to infer what ought to be done under the prevailing conditions and within the range of its available options. Eventually an intelligent support system must be able to build a record of previous behaviours and mismatches between required and actual performance of individual drivers and to infer from such a record what is causing any systematic error tendencies.

(d) *The teacher*
The didactic component decides how to communicate with the driver in terms of information channel, order and urgency of messages, and type of intervention. Here we have to deal with two aspects: first, immediate attempts at warning (e.g., to avoid an accident) and, second, long-term adaptation (within the system itself, including adaptations of the model of the actual driver).
[15]

1.7 The GIDS implementations

The GIDS automobile (ICACAD)

The GIDS project has been working towards an operational prototype implemented in an automobile (Figure 1.4). This vehicle, known as ICACAD, which stands for Instrumented CAr for Computer-Assisted Driving, is special in the sense that it not only incorporates a complete GIDS prototype system, but is also an experimental vehicle for behavioural studies. This implies that it is possible to measure behaviourally relevant variables of the vehicle, the environment, and the driver. This vehicle was specially developed at the TNO Institute for Perception within the framework of the GIDS project. It is based on an existing design of an instrumented vehicle for road user studies, modified so as to accommodate the GIDS prototype.

Figure 1.4 ICACAD, the GIDS demonstration vehicle

The Small World simulation

Despite the heavy constraints imposed on the overall system design by the Small World, it has been a major task to compile a sufficiently detailed inventory of driver performance data, to implement the various event representations, and to analyze **[16]** the dialogue structure of the GIDS system. All this constitutes the required knowledge base for a driver support system that we may, indeed, call intelligent. This requirement leads to the problem of creating and testing a sufficiently large set of event sequences, among other things to rule out the possibility of inappropriate warnings or instructions. Rather than realizing this complicated generate-and-test procedure from the armchair or in a costly real-world experimental programme, a Small World simulation was developed at the Traffic Research Centre of the University of Groningen (Figure 1.5).

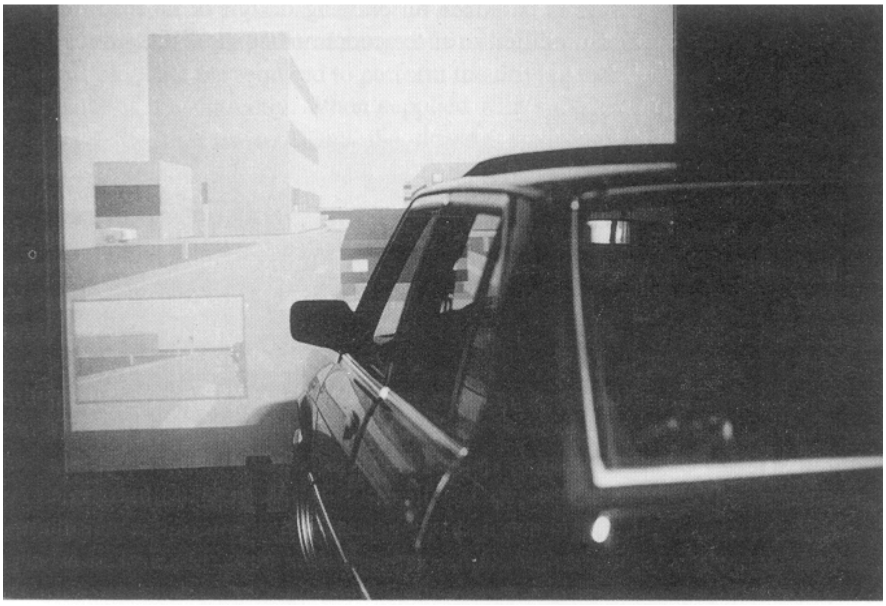


Figure 1.5 The TRC simulator, another GIDS *demonstrator*

This facility allows the testing of a wide range of event representations, message structures, and dialogue scheduling, that arise when driving through a simulated environment. Thus it greatly expedites the process of implementing and extending the GIDS knowledge base, as this depends in large measure on our ability to identify an appropriate set of constraints on what otherwise would be an infinite set of possible, but largely dangerous, unacceptable actions. By selecting the proper constraints, the most abstruse consequences of certain manoeuvres can be ruled out on an a priori basis. At the same time the Small World simulation allows an evaluation **[17]** of the GIDS system prototype under simulated driving conditions, especially in those situations that are too hazardous for testing under real driving conditions.

1.8 The scope of this book

Part I of this book describes the scientific and technical foundation of the GIDS concept. This is based on the well-known subdivision of the road traffic system into three major components: road - vehicle - driver. In Chapter 2 the driving task and the driving environment are analyzed. In Chapter 3 the focus is on the characteristics of the driver. Then, in Chapter 4, we turn to the interactions between the driver, the vehicle and the environment and, more specifically, to the concept of driver support.

Part II is devoted to the actual GIDS system, its specification and implementation. First, in Chapter 5 the constraints imposed on the actual design are discussed in some detail. Some of these constraints were dictated by practical limitations, others by the more fundamental restrictions inherent in complex and ill-defined task domains such as road traffic. In Chapter 6 the representation and manipulation of knowledge by the GIDS system are described in detail. The functional architecture of the GIDS system that allow GIDS to behave adaptively in the specified domain is covered in detail in Chapter 7 and the hardware and software structures in which GIDS has been realized are dealt with in Chapter 8. One version of the GIDS prototype is operational as an in-vehicle real-world system; a second version operates in a simulated environment. The latter system, which is described in Chapter 9, not only allows more complicated and hazardous behaviours to be studied, but it has the added advantage of providing the possibility of rapid prototyping for future extensions of the GIDS system.

Part III covers the evaluation of the GIDS system's technical and behavioural performance (Chapter 10), its potential impact and acceptance (Chapter 11) and, in conclusion, its importance for the development of RTI technology (Chapter 12). This last chapter closes with some recommendations regarding the further development and application of GIDS.

References

DRIVE (1988). *Call for papers.* Brussels: The European Communities, DRIVE Central Office.

GIDS (1988). *GIDS, Generic Intelligent Driver Support System: A proposal for research.* Haren, The Netherlands: Traffic Research Centre, University of Groningen. **[18]**

Michon, J. A. (1985). A critical review of driver behavior models: What do we know, what should we do? In L. A. Evans & R. C. Schwing (Eds.), *Human behavior and traffic safety. (pp.* 487-525). New York: Plenum Press.

Michon, J. A. (2 September, 1987). Twenty-five years of road safety research. Opening address to the Second International Road Safety Conference, Groningen, The Netherlands, 1-4 September, 1987. *Staatscourant, no.* 168, 4-6.

Sleeman, D., & Brown, J. S. (Eds.). (1982). *Intelligent tutoring systems.* London: Academic Press.

GIDS Project Consortium

Generic Intelligent Driver Support (GIDS) has been studied between 1989 and 1992 as project V1041 of the DRIVE programme of the European Economic Community. It brought together eleven partners from five EEC countries and two partners from the EFTA country Sweden [now all EU countries]. The GIDS Consortium was composed in the following way.

Partners

BMW AG (D)

Delft University of Technology (NL)

INRETS- LEN (F)

MRC-Applied Psychology Unit (GB)

Philips Research Laboratories (NL)

Saab-Scania AB (S)

Swedish Road and Traffic Research Institute VTI (S)

TNO-Institute for Perception (NL)

Traffic Research Centre, University of Groningen (NL)

Tregie Groupe Renault (F)

University College Dublin (IRL)

University of the Armed Forces Munich (D)

Yard Ltd (GB)

Project Coordination

Prof. Dr. John A. Michon (Project Coordinator)

Marja J. Kuiken, M.A. (Deputy Project Coordinator)

of the

Traffic Research Centre, University of Groningen (NL)

John A. Michon (Editor)

Generic Intelligent Driver Support:
A comprehensive report on GIDS
London and Washington DC: Taylor & Francis, 1993

Table of contents