

A COMPUTER-BASED SYSTEM FOR LICENSING ELDERLY DRIVERS AND POSSIBLY OTHERS

Earl L. Wiener
University of Miami

For years the power of the states to license and regulate local matters for the general welfare has gone unchallenged. Under the legally dubious doctrine that driving is a privilege and not a right, arbitrary standards and procedures were established to implement state laws, to select those drivers who would be issued permits, and to revoke or suspend the permits of licensed drivers who were considered to have abused their privilege.

But the right-privilege distinction is now in demise, and the whole issue may soon be meaningless. Recent court decisions have all but destroyed this distinction.

The shaky legal basis of licensing now brings into sharp focus the problem of predictive validity and may soon put states on the defensive in court to justify their tests. Legislators and license administrators may now have to turn to researchers for help in devising driver quality control devices that are scientifically valid and therefore legally defensible under the due process clause. Perhaps the only reason this has not arisen already is that so few persons are denied licenses and many elderly "voluntarily" surrender their licenses for fear of failure and, in so doing, do not force the issue.

APPROACHES TO LICENSING AND EXAMINATION

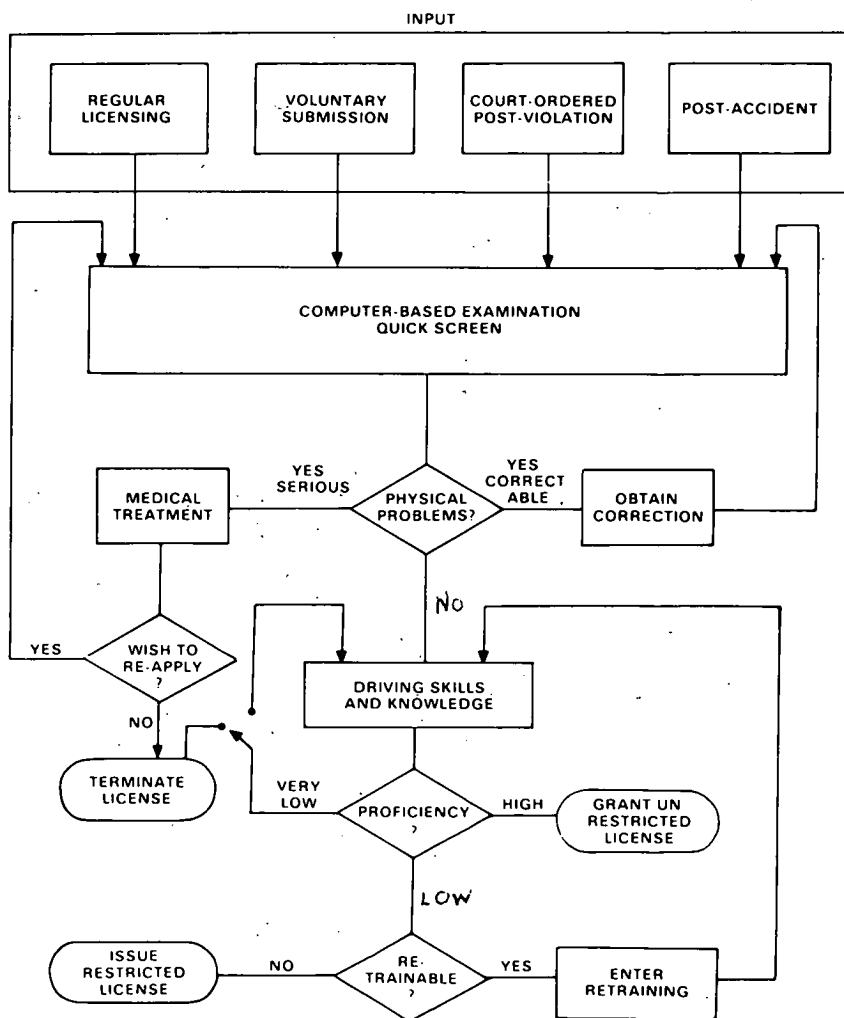
A system for examining the elderly driver must meet the following criteria:

1. It must be legally defensible;
2. It must be socially relevant—that is, it must achieve some goals for the betterment of society; and
3. It must be scientifically valid (otherwise it could not meet the first two conditions).

The proposed system is applicable not only to the elderly driver but also to any "problem class" of driver, such as the young, those with diagnosed illness or physical impairment, and those with high violation records or recent accidents.

The proposal is that certain drivers be submitted, either voluntarily or by court decree, to a multiphase driving examination, not unlike the automated screening devices being implemented in health maintenance organizations. The actual hardware would be computer-based; more will be said of the technique later. Figure 1 shows the input and output of the system. Although there is no reason why ordinary license applicants and reexaminees could not be put through the same screening device, the focus here is on elderly drivers

Figure 1. Proposed computer-based licensing system.



whose participation would be voluntary (possibly as an alternative to voluntary surrender or lapse of their permits) or be based on a court decree.

As the flow chart indicates, subjects first submit to a rapid screening of vision, hearing, and gross measures of sensorimotor functioning. Those passing legally acceptable criteria, as specified by the Highway Safety Act of 1966, are tested for driving skills. Those with remediable defects are referred to the proper source of correction (physician, ophthalmologist, etc.) and reenter later for examination. Those with serious or possibly irremediable problems are referred for more extensive examination or treatment, and may or may not later reenter the licensing system for another attempt. This aspect of the screening system may yield a considerable social dividend quite apart from quality control of drivers; as Waller has pointed out, traffic accidents can be the first indication of presymptomatic physical conditions.

The next stage of examination is testing of knowledge of driving laws and signs, basic skills, and a simulated driving task. (Such items as knowledge of laws and recognition of traffic signs may indeed have low predictive validity, but they will probably always be included in license examinations for their high face validity in the eyes of legislators and administrators.) Exactly what should be included at this stage of examination is,

of course, the question that we are not prepared to answer, but through extensive research such a determination can be made. There are no shortcuts: Development of the items to be included in this battery will require years of research and followup. But no items currently included in licensing examinations have proven ability to predict accidents and violations, so we can only improve. Even a seemingly obvious item such as visual acuity appears to be unrelated to driving performance, except possibly in the extreme.

As the flow chart indicates, after the basic skills are tested and the subject has completed a simulated driving task, a proficiency measure is computed. Those with high proficiency scores could be issued unconditional licenses. Those with extremely low scores may reappear for retesting later. And those with moderate scores, or certain classes of deficiencies, could be branched to a number of alternatives including

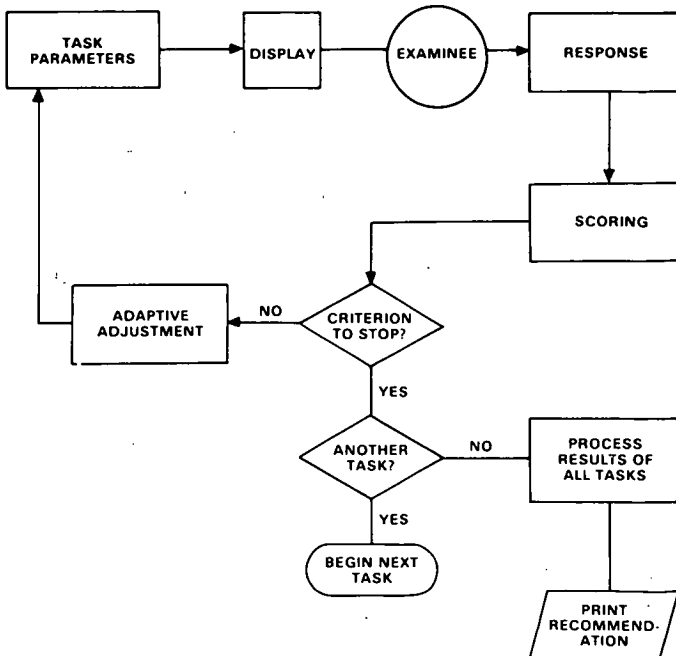
1. A road test with an examiner,
2. A restricted license (e.g., daylight hours only or city streets only), and
3. Retraining and reexamination.

A computer-based system for implementing such an examination would combine elements of conversational computing as applied in automated health screening, driver examination by a simulated road test, and adaptive measurement techniques.

Laboratory computers allow use of adaptive or self-adjusting tasks for proficiency measurement. Adaptive tasks are those in which the subject's scored output mediates or adjusts the input in such a way that, as he masters the task, as reflected in his measured score, the task is made more difficult, and vice versa (Fig. 2). The subject is thus essentially an element in a closed-loop system. The advantage of adaptive techniques is that they allow rapid determination of proficiency level without wasting time testing the subject at levels too easy or too difficult.

Using adaptive measurement, we could very quickly determine scores on a battery of multiphase tests. These individual scores would form a performance vector, and, by another series of decision rules, which only a great amount of research could

Figure 2. Self-adjusting system as applied to testing of a license examinee.



determine, a recommendation for action on the examinee would be typed out, perhaps as one of the alternatives already listed. A few of the tests that might be considered for inclusion in a first approximation of a test battery are

1. A fast-adapting test of visual acuity,
2. A fast-adapting test of auditory threshold,
3. A test of vigilance or alertness,
4. Various biographical, health-related, and driving experience data, and
5. A simulated driving task.

THE CHALLENGE TO RESEARCH

This paper outlines a double-barreled research problem:

1. To develop individual items, for inclusion in the battery, that have predictive validity, and
2. To combine scores on these items according to a series of decision rules that permit a logical, valid, and legally defensible recommendation for licensure.

ACKNOWLEDGMENTS

The author gratefully acknowledges the assistance of Larry Keeler, Rhea Schwaber, and Anne Manchester. The computer system discussed here was made available from a research project of which the author is principal investigator, sponsored by the National Institute of Occupational Safety and Health.

Discussion

Frederick E. Vanosdall, Michigan State University

In proposing a computer-based driver licensing system, Wiener points to the need for a comprehensive system that provides legal, socially relevant, and scientifically valid means for screening various "problem driver" types. The major concern expressed is for the elderly.

To develop systematized methods for rapid screening of vision, hearing, and gross measures of sensorimotor functions requires that criteria suitable for evaluating all drivers' performance on these tests and their pertinence to safe driving be developed.

The essence of Wiener's presentation, "a logical, valid, and legally defensible recommendation for licensure," agrees with concerns and objectives of enlightened administrators. They recognize the need for interested and competent researchers who will discuss, review, and identify problem areas in driver licensing. From joint interests by governmental agencies and researchers, projects could be undertaken to resolve problems thwarting improvements in driver license examinations. As Wiener points out, "Exactly what should be included at this stage of the examination is, of course, the question we [researchers] are not prepared to answer, but through extensive research such a determination can be made."

In his proposed examination of the elderly, Wiener develops concepts having general application to all beginning drivers. The value of consolidating examinations into a test battery is yet to be determined. The most important aspect of Wiener's viewpoint is his recognition that researchers must consider what is needed to establish and substantiate driver licensing examinations based on performance levels for drivers that relate to the demands likely to be experienced by drivers and how their conditions influence their performance.

Realistically, application of this approach may not be financially possible, except at

an experimental level, and only if joint or multidisciplinary study efforts can be funded by the public or private sector.

In his review of the limitations of existing driver license examining procedures, Wiener implies that licensing examinations should predict accidents and violations. There is an increasing body of research concerning this issue. It is clear, however, that Wiener's consideration of the research needs in driver licensing includes the complexity of the driving task. In determining drivers' qualifications, he goes beyond all but a few of his predecessors. Indirectly he also identifies a question for future research: What can be done to overcome drivers' human tendency to adopt fixed habits of driving in a highly dynamic and changing environment, which may be characteristic of elderly drivers?

Scientific foundations for future driver examinations and a criterion for their evaluation are major challenges for both the researcher and driver licensing administrators; it is hoped that they will soon begin traversing that course jointly and cooperatively.

For future consideration, a forum for administrators and researchers offers one approach to identifying what is needed and feasible.