THE EVOLUTION OF THE PASSENGER INTERFACE

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ABSTRACT

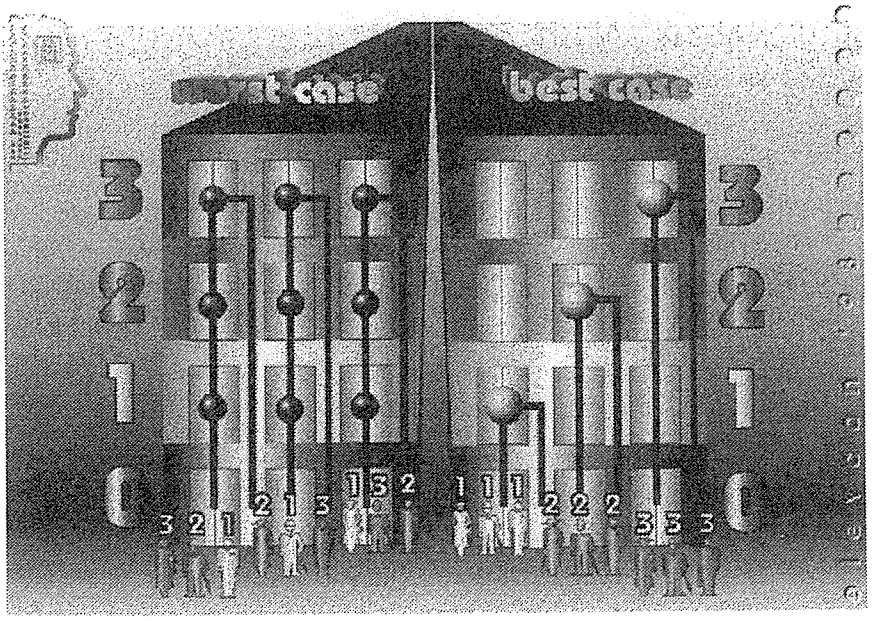
"A machine in the best case can only meet a demand as well as it can recognise it". This fundamental statement is even true for the passenger-lift interface. The presentation explains the evolution of this interface from the 'One-Button-Call' system to the newest interface, where the required destination is entered on a hall station. It is emphasised that the more precisely an individual's need can be recognised then: ideal lift resources can be planned; larger handling capacity can be provided; and the passengers' are better satisfied. Based on these concepts two new, individual, future interfaces and their corresponding lift systems are presented.

The wrong Interface ...

Assumption: A building with **3 upper floors**, a group of elevators with **3 elevators**, each one of which can take **3 passengers at the most** (not a very useful group, but it is only an imagined model !)

Situation: Nine passengers are using these elevators to get to three different destinations. 3 (marked "1") passengers to the first floor, 3 (marked "2") passengers to the second floor, etc. Because the system can only transport 9 (3x3) people at the same time, this situation shows the capacity limit of the group.

There are two extreme options as to how the passengers might group for the elevators:



1. The **worst** case (left), where every elevator is assigned 3 destinations and must accordingly stop 3 times (with passengers).

2. The **best** case (right), where each elevator is only assigned one destination.

It is clear that the time to bring the passengers to their destination and to return to the main stop is strongly reduced in the right situation. This means that the situation on the right is the much faster way of bringing the next 9 passengers into the building.

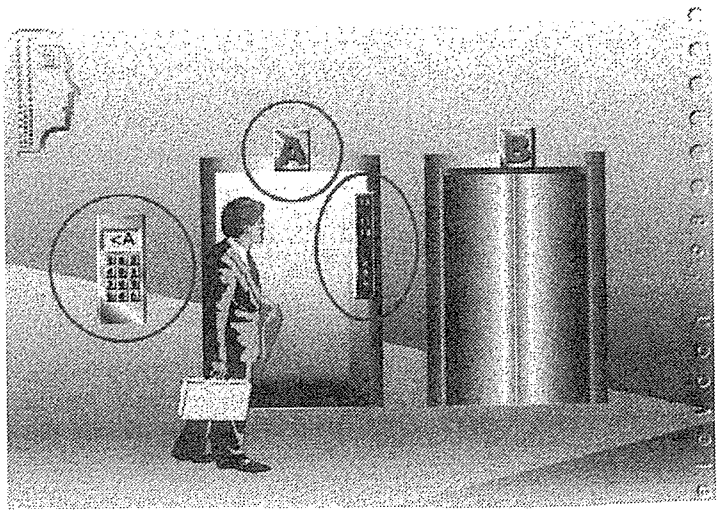
Editors note:

No Biographical Notes provided.

Conventional systems are incidentally confronted with the whole spectrum of possibilities between the right and left situation, as they can neither control the flow nor assign the destinations to the elevators. On the contrary, **conventional "controllers" are controlled by the random behavior of the passengers: all conventional controls are identical during the up peak situations**, independent of the excellent quality of the control algorithm or the manufacturer. The todays interface with "call" - buttons (up and down) on the floor and the destination buttons inside the car doesn't allow the control or management of the traffic flow. **How could a better interface work** , which allows the controller to manage the traffic flow in a manner that it fits the right situation always ?

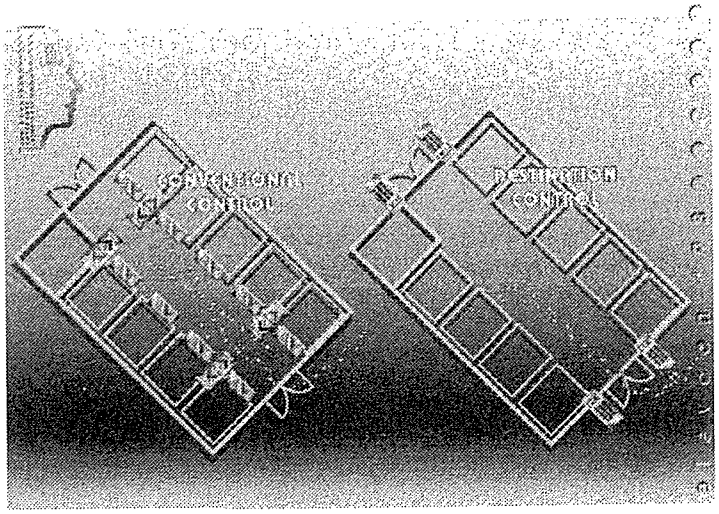
The "other" Interface

The most important requirement for a new and better interface is a possibility to **get the passengers destination before he enters the car**. An example of such an interface: It is just as simple as it is natural. The passenger enters his destination at a terminal (red circle left). The display terminal has 10 buttons just like a telephone and a display on which the entry is confirmed. As soon as the destination is entered, the control algorithm allocates the best elevator on the display. The passenger now walks over to the appropriate landing door, the name of which is permanently marked above the door (red circle middle). As soon as the door opens, a so-called destination indicator is located on one or both sides of the door. It shows the destinations of all passengers boarding on this floor with a flashing light. This definitely confirms that the elevator truly travels to the individual destinations. The car now only contains the door open / close and the alarm buttons. The car destination buttons are not required. As soon as the destination is reached, the destination display flashes and indicates the corresponding destination until the door is opened. This signals to the passenger that he has arrived at his destination. **We call this system "destination control" system.**



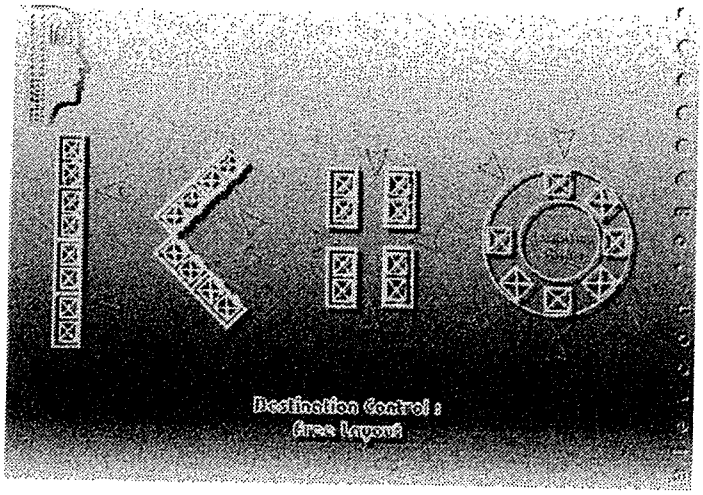
Why do passengers like destination controls ?

left: In conventional systems the passenger pushes a direction button on the floor (as far as it is not already pushed or is flashing). Then he moves to the strategically best position which is the center of the group of nine from the example left, in order to be able to reach all landing doors in the shortest possible distance. Handicapped passengers, those with a shopping cart or older people have a big disadvantage because they are often not fast enough to reach a door which is about to close.



right: By comparison to this, the destination control system offers a clear way directly to the allocated landing door. The conventional, nervous waiting time is replaced by a relaxing walking time from the terminal to the landing door and a calm and short waiting time in front of the door, until it opens. If the terminals are arranged „on the way" to the elevator group, which should always be the goal, wherever possible, it will never be necessary to return to the allocated door. Based on experience, the passengers use those terminals which are furthest away from the elevator group much more often because they have learnt, that the end of the approaching time very frequently coincides with the door opening for these terminals. As a matter of fact, the destination control system should try to optimize these coincidences, especially for lighter traffic. The longer the approaching time, the greater is the selection of elevators for the controller, so that it can allocate the most appropriate elevator. **The destination control is the ideal concept to manage the traffic flow in all traffic situations.**

Why do elevator consultants, architects and building owners like destination controls ?



Because it makes the largest selection of elevator arrangements possible. It gives architects the greatest possible flexibility in the design of new buildings and can handle existing arrangements more efficiently than other conventional controls.

left: elevators in line; groups with more than 4 elevators
Traditionally a problem, because the time it takes to get to the elevators is too long to be able to reach the still open door. Destined for MICONIC 10.

second from left: corner arrangement
Conventional systems cannot do anything about the often high density of people in the corner. MICONIC 10 solves the problem by not allocating to both elevators in the corner at the same time.

second from right: typical big installation in existing buildings
Passengers do not like such arrangements (with conventional control) because they have to look for „their" elevator within a 360 degree range. The ways to the elevators are by far too long and the passengers often very nervous during heavy traffic.

right: an interesting arrangement for the future
The elevators are arranged in a circle, accessible from the outside. The stairs and the maintenance are in the center. Everything together reflects the static core of a building. Conventionally impossible; for the destination controller no problem.

Summary: Destination Controls and Customer Benefits

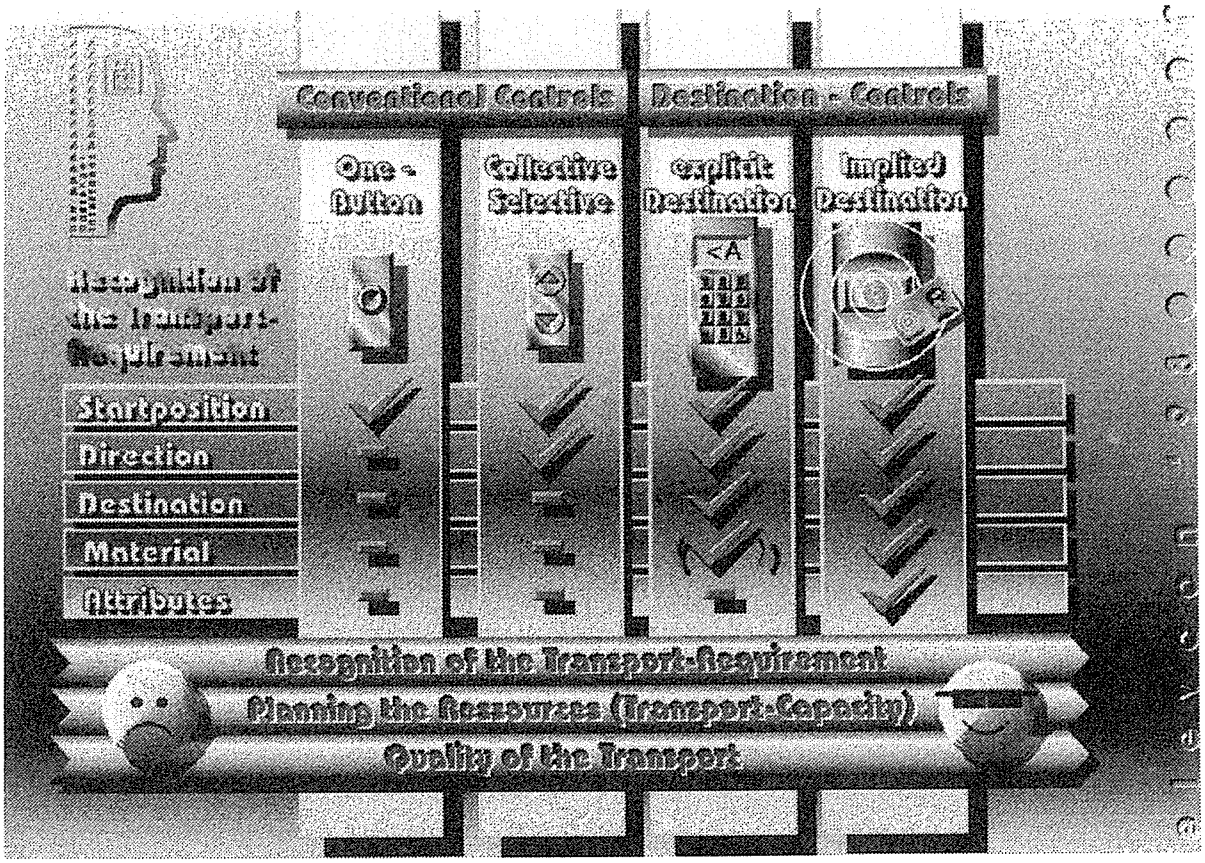
The Evolution of the Passenger Interface

Lets first look at the evolution of the passenger interface for elevators until today. The passenger interface is the part of the elevator system which translates the passenger's desire into the elevator system language and, vice versa, informs the passenger about system decisions.

A machine in the best case can only meet a demand as well as it can recognize it.

This fundamental statement should now be analyzed with today's interface, without going into too much depths about its historical development. A pickup button (left) is of course a very poor image of the actual desire of the passenger: the machine recognizes only that an elevator is required on the concerned floor. Because the information is so poor, the control has to assume the worst case and send an empty car there. For a Simplex elevator this means that 100% of the resources are used up. For two buttons UP and DOWN (second from left) on the floor, this is already an improved information, as the machine can allocate the part of the resources best suited to the up and down traveling passengers. The transport capacity is already better and the actual passenger need is better satisfied as well. It is obvious that capacity is improved by better recognizing the passenger's demand. This leads to the destination control type (second from right). This controller groups all passengers with the same destination and offers another option for handicapped passenger at the terminal. This option results in a longer approach and door opening time, once it is activated. In addition to that, there are the „codes" that can be entered at the terminal in order to activate special

travels. Destnation controllers with explicit demand entry presently offer the highest performance as well as the best satisfaction of the passengers' needs.



Based on this, the following can be concluded and emphasized:

The more precise an individual need can be recognized,

- **the more ideal the resources can be planned,**
- **the larger the transport capacity is,**
- **the more precise the individual need can be met,**
- **the better the customer's satisfaction.**

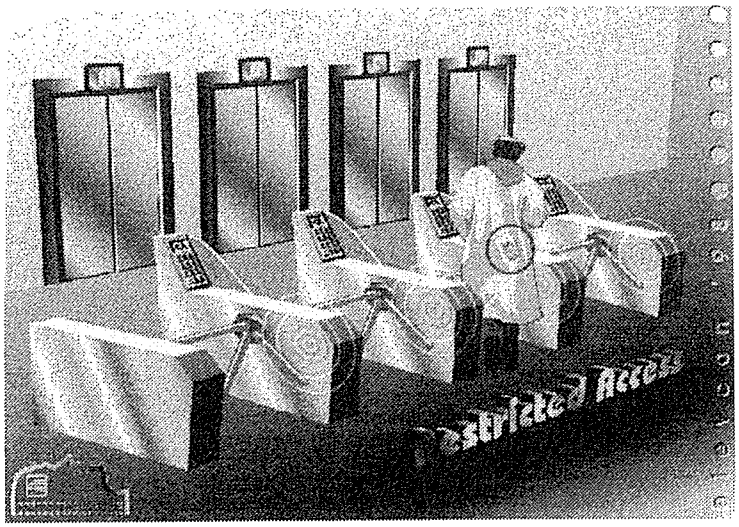
It seems reasonable to assume that an even more accurate recognition of the individual passenger desire will improve the general performance. Actually, the passengers' needs are also individual: while one passenger in a wheelchair needs a longer approach, door opening time and more room in the car, another blind passenger requires some verbal guidance to get to his destination. The access restrictions for passengers are also individually coordinated by the building owner. To achieve higher individuality, more buttons could for example be added to the destination control terminal (e.g. for blind and walking disabled passengers). This would mean, however, that the interface to the passenger would get more and more complicated, as well as difficult to understand, and more susceptible to sabotage.

The next step should rather be that the system implies the present individual desire of the passenger on the basis of a clear identification of the relevant passenger (actually, the identification medium and not the passenger is being recognized).

Nowadays there are a variety of systems for the contact-free recognition of the also versatile identification media on the market. Their costs vary tremendously, the biggest difference however, is most of all in the reading distance. The cheapest systems have a reading distance of only few centimeters, while more expensive systems can function up to 18 meters and can even recognize several identification carriers in the reading area at the same time.
The application possibilities for such systems in combination with elevators are almost inexhaustible. A few basic systems of this variety of options will be explained in the following. All of them can also be combined with each other.
Basic types:

- Building security with an active integration of the elevators.
- Individual operation by generally handicapped people (also shopping carts etc.) or specially preferred people.
- Access restrictions dependent on the start floor and the individual passenger.
- New tasks for the elevator.

General access restrictions



Access to office and administration buildings or floors is often restrictive. Turnstiles or similar security checks are used for this purpose. The identification media of the person opens or refuses the access. Very often the access is linked with the clock in-/clock out machines. It is almost inevitable to integrate the elevator into this system. That means that with the opening of the turnstile for the passenger, the destination as well as the most appropriate elevator is allocated to him. If the allocated destination does not correspond to the actual requirement, the presently desired destination can be entered via the push-buttons, which is of course also subject to the individual restrictions.

Shopping Centers, Parking Garages

For an elevator it makes a significant difference whether a call is initiated by an individual person or a person with a cart, who often takes the place of 5 people in a cabin.

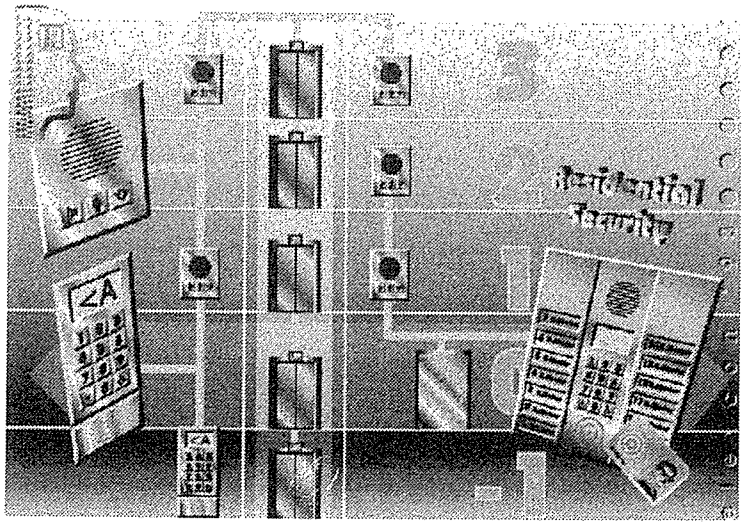
- The shopping carts are provided with electronic identification systems (IDs). These systems define and clearly identify the required space of the vehicles.
- Visitors who have a shopping cart with them automatically receive a proper space reservation in the car.

- An automatic destination allocation is possible through the corresponding arrangement and logistics. The information pertaining to it can for example be derived from the registered issuing depot of the car or the passage way of certain areas.
- The visitors do not need to memorize parking areas for their cars or where certain stores are located. They are guided to the right place by transportation means like elevators or escalators.

Only open systems can meet with the demands of a constantly changing world. The whole subject of "Shopping" is expected to go through major changes medium-term. The process of buying - selling will be newly designed with direct consequences for the transportation means. The destination call concept leaves all options open.

Multiple family home, small company high-rise

The use of modern technologies does not only make sense for large structures as it is shown in this application. Ensuring privacy in the living environment is becoming more and more important. Mechanical key systems are continuously replaced by (touchless) electronic keys. These also allow an integration of the elevator, as the example shows:



- People which are identified through a proper key at the building entrance receive access and the reservation for an elevator to their apartment. The use of the elevator does not require pushing any buttons.
- Visitors receive access by the remote control of the door release. An elevator is allocated to them for the floor from which the release was initiated.
- Residents can already reserve an elevator from inside their apartment. Use of the elevator is thus only possible for residents and explicitly authorized persons.

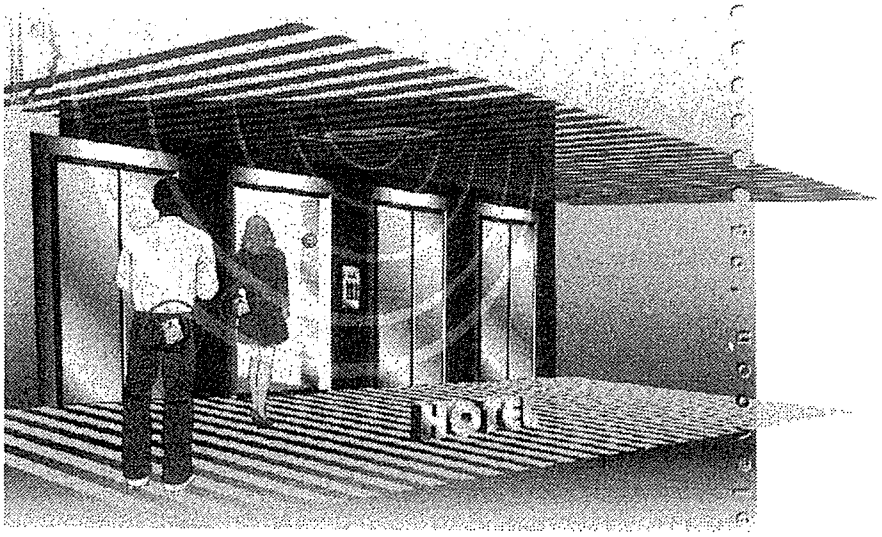
A simple linking to other systems, like in this case the intercom, makes completely new functions possible. Transports are not totally detached from all other events, but integrated into their origin and purpose. If this is taken into consideration, the resulting systems are natural and understandable for the user. The apartment house presented here does not really need an explanation to offer comfort as well as security to the user.

Hotel

A certain protected privacy is also increasingly required in hotels. With inductive cards which are handed out to the hotel guests when they check in, an unlimited number of internal restrictions or preferred accesses can be realized. This system can function without any indicators, buttons or displays in the most simple case.

- Each guest receives an electronic ID (touchless key) upon his booking. This key serves an identification purpose and entitles the guest to use certain services.
- The elevator system recognizes all present guests in the lobby and calls an elevator.

- To get to his room the guest may board any elevator. Because of his ID the elevator recognizes him and brings him automatically to the right floor. The ID opens the hotel room and serves as a credit card to open the bar in the room and to use the telephone.
- If a guest leaves his room, the room is locked and an elevator to the main stop is reserved. Because a selection 1 out of n does not have to be carried out, the dimension of a hotel complex is never clearly manifested.
- The ID enables an access to other areas like restaurants, clubs or sauna. Only the desired destination has to be entered by pushing the buttons.



- Staff and visitors alike also receive IDs which authorize and support them according to their function.
- The more useable the ID is, the more interesting it becomes. Extensions, especially refer to the cashless use of payment means (laundry service, room service, etc.) as well as the identification for the exchange of information (search and information services).

Because of the relatively simple connections on which the transport needs are based, the hotels are almost destined for the use of identification systems. A high amount of user-oriented functionality can be realized with simple means under very broad conditions. The elevator does not need buttons or only few and is only available to authorized persons. Important advantages for the guest are offered through the simple, logical and comfortable function. The owner can take advantage of the increased efficiency and differentiate in taking care of the guests.

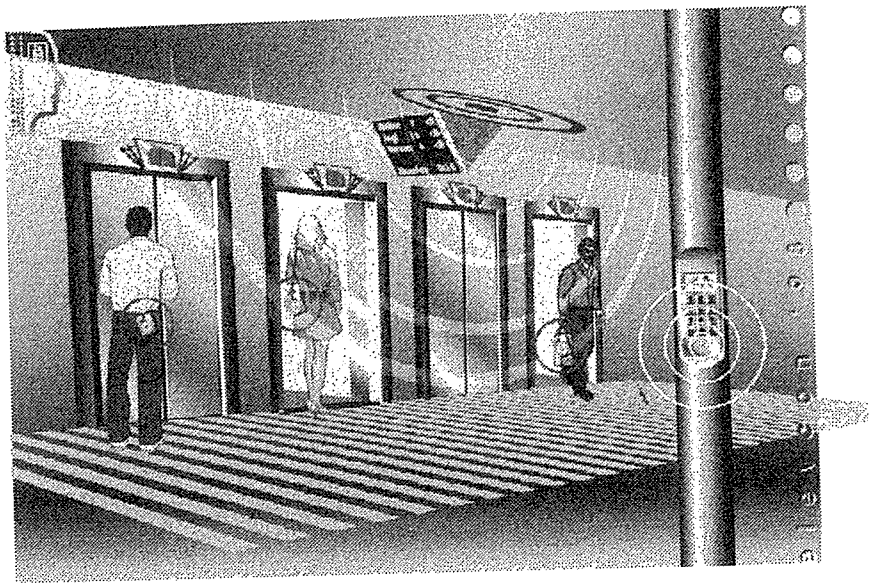
P.S.: Hotels almost never have an UPWARD peak, but a DOWNWARD peak in the morning. Therefore, the explicit allocation of a certain elevator is not necessary in this case. That means that the passengers board the next car that opens the door as for a conventional group control. For a DOWNWARD peak a modern KS control might serve just as well as the destnation control because it knows the destination (the main stop) and thus, could also initiate a boarding zone.

The learning elevator system

The tendency to large office complexes consequently results in the fact that only part of them are actually used by the individual. This usage is linked to functions which are allocated to certain locations and therefore, is very specific. Entering an office building by an employee is very much likely followed by an elevator travel to the working desk of this person. An automatization would be easily possible if the person could be recognized. On the other hand, the control and regulation of the public traffic is gaining an increasing meaning with an also increased complexity of the building. The elevator offers a central point, like the following functional aspects show:

- The regular users of the building receive an electronic ID (touchless key). This ID identifies them and defines the user rights.

- People who carry their ID are offered the appropriate elevator functions, based on their habits. They are recognized when they enter the elevator area and receive a suggestion for the elevator use. Their destination and corresponding elevator is shown to them. They just need to board the allocated car.
- For travels that cannot be derived from the registered user habits, a standard terminal will be made available. The monitoring of the access permits thus maintains guaranteed.
- The public receives access to a restricted area. IDs for visitors that authorize them for certain times and areas are available.
- For special requests like VIP Service, mail distribution, reservation, etc. appropriate IDs are available. Key buttons are not required for this.



- The open structure of the information processing makes application specific extensions and additions simple and possible in terms of system conformity. This for example applies to the linking to the switchboard installation (reservation by telephone), other means of communication or presence recognition systems.
- Safety-relevant additions, like the transport of non-authorized persons in safety areas are realized through appropriate planning algorithms, as well as through the integration of further information. Thus, the load measuring in the car prevents unnoticed traveling because with the person identification system an exact weight allocation is possible.