ELECTRONIC EQUIPMENT OF SELF-ACTUATED MOBILE DEVICE FOR LOAD CARRYING

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Abstract

The device dealt in this work is determined namely for carrying invalid persons on various types of stairs or other not flat surfaces. But it can serve also to other purposes.

To enable fulfilling all given demands, the design was consulted with other research workers solving the tasks of similar features.

Resulting mechanical device, enabling aspects of movement required, is controlled by electronic and microprocessor circuits that obtain the input information from sensitive units investigating the terrain.

Keywords:
mobile device, carry handicaped persons, microprocessor, Fuzzy coprocessor

1. Introduction

Designs of various devices that should carry the loads on the uneven surface are met in the technical practice. The resulting structure depends on the conditions that the given device has to fulfil, on the material used and last but not least on the resourcefulness of the solution.

We want to give a brief treatise of intelligent device, that should be able to move automatically up and down on different types of stairs, turn and to move on the flat surface as well. The device has to be able to carry loads, especially the invalid person. To be adaptable enough, easily turned and transportable to other distant places the device must not be too bulky and too heavy and its centre of gravity has to be low. It is also important that the price should be accessible for Czech handicaped citizens with low incomes.For example American belt-conveyer chair, advertised in the last month on TV, is very robust, long and high, its price of 257,OOO dollars is unacceptable, and moreover it needs a special training.

Selected mechanical principle of our device with the latest electronic integrated circuits and microprocessors enables the smooth continuous movement and in a sense of the word it can substitute the man's thinking, because it is necessary to take into account that handicaped people may have limited speed of some reactions.

With regard to patent procedure we can give only restricted information in this paper.

2. Main results

The main part of the whole equipment is a load-bearing board that remains in horizontal position during its smooth movement upstairs and downstairs. The board is carried by mechanical set, combining two or three coordinated movements: forwards and up [down] according to length and height of the stairs, eventually turning. Necessary data are provided by four sensors that yield information of winding and irregular stairs. Signals from this sensors are elaborated in electronic part [given in Fig. l] that gives commands to the circuits effecting the movement required.

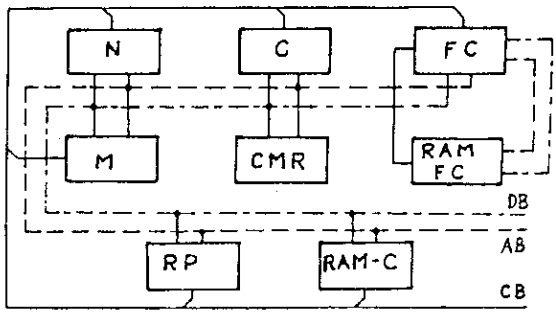

Fig. 1
Block diagram of the electronic part of the device
N - electronic circuits securing the movement up or down
M - electronic circuits for the movement for- and backwards
C - sensor circuits
CMR - central microcontroller
RP - controller of disconnecting, interruption, breaking
RAM-C - central memory
FC - Fuzzy Coprocessor
RAM FC - memory of FC
Mutual information transfer among blocks is not depicted.
DB - data bus
AB - address bus
CB - central bus

During the operation of given device the information is transferred from sensors C to central controller CMR, which communicates with Fuzzy Coprocessor FC. Here the following operations are performed: fuzzifying of crisp values, setting up the inference, determining the weights of the separate information, defuzzifying and repeated cooperation with microcontroller, which gives commands to electronic circuits M and N. This is how to achieve the required smooth movement of the whole device. In Fig. 2 and Fig. 3 is briefly depicted the operation of FC used.

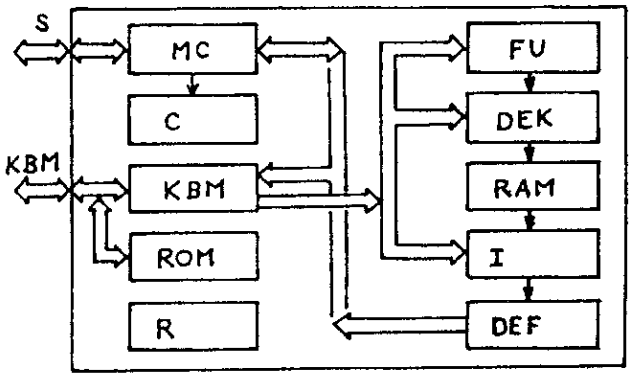

Fig. 2
Block diagram of the Fuzzy Coprocessor Siemens SAE 81 C99
N - microcontroller interface
C clock
KBM - memory interface
ROM - memory
R - controlling element
FU - fuzificator
DEK - decoder
RAM - rule memory
I - inference
DEF - defuzzification

In Fig. 2 is given the Fuzzy Coprocessor block concept. The input information comes to the input part of FC Fuzzy Coprocessor. Then it passes via Mc microcontroller to KBM [Knowledge Base Memory] interface. The defuzzification occurs in the FU circuit, and decoding in the DEK circuit.

With the help of RAM memory the inference and output values are gained.

In Fig. 3 fuzzy algorithms are illustrated. The crisp input values are sent to o.v.s. fuzzifier, subsequently they are compared with the data values in DA.1, and with rules in U.p. After that the values are decoded in D.P. and evaluated in HOD circuit. The part AG yields their comparison and the next stage VAZ computes their weights. Data with DAT 2 are sent to the summerizing SPOJ part. Then the deffuzification occurs and the output results are gained. The whole process is described in literature [1].

3. Conclusion

Finally we can add that the principle of this device is basically simple and its mechanical parts were successfully used in other longterm applications. It is possible to expect that the main features of given device as easy mobility, manageability and relative low price will enable the wide utilization.

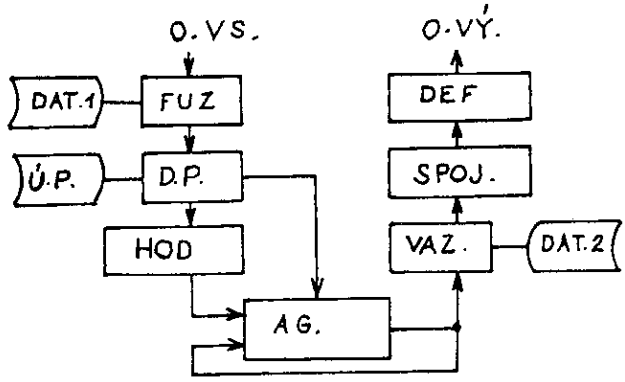

Fig. 3.
Fuzzy algorithms of given FC
O.VS - crisp inputs
O.VY - crisp outputs
DAT 1 - data of membership input values
UP - data of rules
FZ - fuzzification
D.P. - decoding according the rules
HOD - evaluation
DEF - defuzzification
SPOJ - connection
VAZ - weighting
DAT 2 - data for membership output values
AG - aggregating, summary

4. References

[1] Fuzzy Logic coprocessor SAE 81 C99, catalogue of firm SIEMENS, 1994

[2] BABÁK, M. - CHLÁDEK, L.: Architektura a vlastnosti mikropočítačů 8051, catalogue of firm TESLA ELTOS, 1987

About authors, ...

Information not avilable in time of publication.