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SELECTION OF TECHNICAL MEANS OF COMPUTER VISION ACCORDING TO THE ANALYTIC HIERARCHY PROCESS

The problem of real-time image recognition has great relevance and significance in various fields, providing fast and accurate recognition of objects in images, which is of great importance for further analysis and decision-making.

Calculation data:

- | | |
|-----------------------|----------------------|
| Selection criteria: | Decision options: |
| – Type of connection; | – Brio Ultra HD Pro; |
| – Resolution; | – Depth Camera D435; |
| – Frames/sec; | – Camera Module v1; |
| – Megapixels; | – Camera Module v2; |
| – Viewing angle; | – Camera Module 3; |
| – Price. | – Waveshare IMX219- |

77.

To determine the optimal type of camera among 6 options according to the specified criteria, the analytic hierarchy process applied. The hierarchical structure

$$A = \begin{pmatrix} 1 & a_{12} & \dots & a_{1n} \\ 1/a_{12} & 1 & \dots & a_{2n} \\ \dots & \dots & \dots & \dots \\ 1/a_{1n} & 1/a_{2n} & \dots & 1 \end{pmatrix} = \begin{pmatrix} 1 & 1/5 & 1/5 & 1/3 & 1/3 & 1/7 \\ 5 & 1 & 3 & 6 & 3 & 1/6 \\ 5 & 1/3 & 1 & 6 & 5 & 1/7 \\ 3 & 1/6 & 1/6 & 1 & 1 & 1/7 \\ 3 & 1/3 & 1/5 & 1 & 1 & 1/5 \\ 7 & 6 & 7 & 7 & 5 & 1 \end{pmatrix}$$

Microsoft Excel spreadsheet processor was used to compare objects according to each of the criteria. The global priority for each type of camera is calculated according to the formula:

$$A = \sum_{i=1}^n k_i w_i,$$

where k_i is the criterion priority vector;

w_i is the priority vector of the object according to each criterion.

The calculation results are summarized in Table 1.

Table 1 – Global priorities

Camera name	Global priority
Raspberry Pi v1	0,1725
Raspberry Pi v3	0,2641
Waveshare	0,3137
Raspberry Pi v2	0,2469

depicted in Figure 1 includes the objective, criteria, and alternatives.

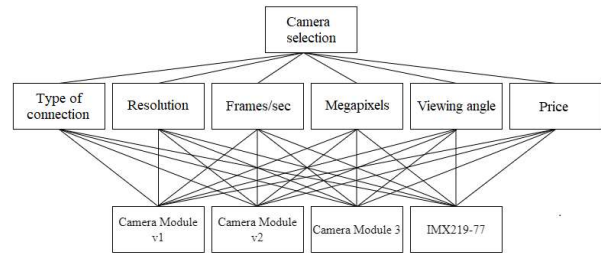


Fig. 1 – Hierarchical structure

According to Saati's scale of relative importance [1], priorities were determined and a matrix was formed, where the relative importance of parameters a_{ij} characterizing the weight of judgments is compared in

$$\text{pairs } \frac{\omega_i}{\omega_j} = a_{ij}.$$

According to the results of calculations using the analytic hierarchy process, the optimal type of camera for the computer vision system was determined.

References

1. Saaty T.L. Relative measurement and its generalization in decision making why pairwise comparisons are central in mathematics for the measurement of intangible factors the analytic hierarchy /network process, 2008.

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