The number of positions having 1 in both vector K and vector V is equal to the number of pertinent documents in the output, that is, to r. Consequently,

$$\sum_{i=1}^{N_0} k_i \cdot v_i = r.$$

Besides, $|k_i - v_i| = 1$ (and, consequently, $(k_i - v_i)^2 = 1$) in cases of $k_i = 1$ and $v_i = 0$, that is, in $(C - r)$ cases, and cases of $k_i = 0$ and $v_i = 1$, that is, in $(N - r)$ cases; in all other cases $|k_i - v_i| = 0$ (and, correspondingly, $(k_i - v_i)^2 = 0$). Then

$$\cos \phi_{KV} = \frac{\sum_{i=1}^{N_0} k_i \cdot v_i}{\sqrt{\sum_{i=1}^{N_0} (k_i)^2} \cdot \sqrt{\sum_{i=1}^{N_0} (v_i)^2}} = \frac{r}{\sqrt{C} \cdot \sqrt{N}}$$

$$= \sqrt{\frac{r^2}{C \cdot N}} = \sqrt{\frac{r}{C} \cdot \frac{r}{N}} = \sqrt{R \cdot P};$$

$$\rho(K, V) = \sum_{i=1}^{N_0} |k_i - v_i| = C - r + N - r = C + N - 2r;$$

$$\rho_1(K, V) = \sqrt{\sum_{i=1}^{N_0} (k_i - v_i)^2} = \sqrt{C + N - 2r}.$$

Thus the models discussed (as a matter of fact, three models we discussed differ from each other only by the instruments for the search results evaluations) led us to the complex search characteristic $I_2 = \sqrt{R \cdot P}$ (which was repeatedly mentioned earlier) and made it possible to obtain complex search characteristics $I_3 = C + N - 2r$ and $I_4 = \sqrt{C + N - 2r}$. We will note that characteristics I_3 and I_4 are equal from the point of view of their use for the evaluation of search results.

With characteristics I_3 and I_4 as the basis, one can construct a CSC of a more common representation. For example,

$$I_5 = 1 - \frac{I_3}{N_0} = 1 - \frac{C + N - 2r}{N_0} = \frac{N_0 - C - N + 2r}{N_0}$$

$$= \frac{L - l - r + 2r}{N_0} = \frac{d + r}{N_0} = \frac{d}{N_0} + \frac{r}{N_0} = \frac{d \cdot L}{L \cdot N_0} + \frac{r \cdot C}{C \cdot N_0}$$

$$= \frac{S(N_0 - C)}{N_0} + R \cdot P_0 = S(1 - P_0) + R \cdot P_0.$$

One can try to build up a "stock" of the CSCs by applying models similar to the ones used in the preceding. For this purpose one can, for example, use

other functions for evaluating closeness of vectors K and V. Presently a number of functions for evaluation of vector closeness, which differ from those used earlier, are being considered by information science researchers although, in our opinion, they are less "natural" in this sense than the previous examples. Let us discuss one such function:

$$\gamma(X, Y) = \frac{\sum_{i=1}^{N_0} x_i \cdot y_i}{\sum_{i=1}^{N_0} (x_i)^2 + \sum_{i=1}^{N_0} (y_i)^2 - \sum_{i=1}^{N_0} x_i \cdot y_i}.$$

Applying this function to vectors K and V and replacing the corresponding expressions by C, N, and r, we get the following:

$$\gamma(K, V) = \frac{\sum_{i=1}^{N_0} k_i \cdot v_i}{\sum_{i=1}^{N_0} (k_i)^2 + \sum_{i=1}^{N_0} (v_i)^2 - \sum_{i=1}^{N_0} k_i \cdot v_i} = \frac{r}{C + N - r}.$$

By dividing the numerator and denominator of the produced expression by r (assuming $r \neq 0$) we get the following:

$$\gamma(K, V) = \frac{1}{\frac{C}{r} + \frac{N}{r} - 1} = \frac{1}{\frac{1}{R} + \frac{1}{P} - 1}.$$

Thus, application of $\gamma(X, Y)$ gives us the complex search characteristic

$$I_6 = \frac{1}{\frac{1}{R} + \frac{1}{P} - 1},$$

which is one more characteristic produced on the basis of the models under discussion. At the same time, we will note that similar CSCs constructed in other ways have already been reviewed by other authors (for instance, see van Rijsbergen, 1979). Nevertheless, the given example indicates that further use of the functions under discussion can provide a replenishment of the CSC "stock" with new characteristics.

Now we will discuss a modification of the discussed models by using other scales to determine k_i and v_i. For this purpose we will use binary scales: $k_i = 1$ if the i-th document of the collection is pertinent, and $k_i = -1$ otherwise; $v_i = 1$ if the i-th document is found during search, and $v_i = -1$ otherwise. Would these scales lead us to the construction of complex search characteristics