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THE ALGORITHM OF THE THREAD FEED DESIGN SYSTEM ON CIRCULAR KNITTING MACHINES

While designing the equipment for light industry raises the challenge of thread path. Total friction which is in force on thread must be kept to a minimum. The initial conditions contain trajectory coordinates of the starting point (source), ending point (purpose) and obstacles coordinates.

If the trajectory passes obstacles, the friction force arises, which depends on the angle of the circumference of the thread that guides. Therefore, the goal is to define trajectory with a minimum sum of angles of the circumference of the thread that guide.

Trajectory *T = (s, u2, l3, l5, t)* changes the direction of movement of the thread at the points: u2, l3, l5. (on Figure 1). The values of an objective function:

$$F(t) = \alpha + \beta + \gamma. \qquad (1)$$

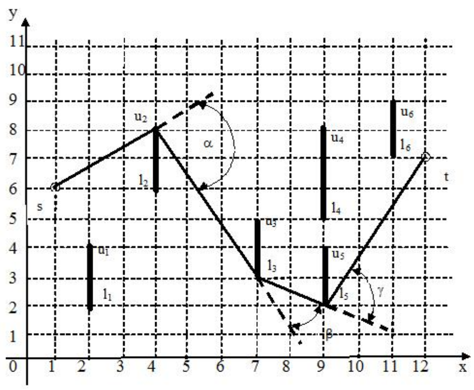

Figure 1. Example of the initial conditions and the permissible trajectory

In general, the problem of finding the optimal path in the graph is represented as follows. There is given undirected graph *G = (V, E)*, in which are identified following vertices: *vs* - source, *vt* – purpose and others - ending points; *V = {v1, v2,* *v2n+2}* – the number of vertices, *E = {e1, e2 ., em}* – the number of ribs (see Figure 2). Ration (3) connects values of the function on the trajectory and it is Belman's equation.

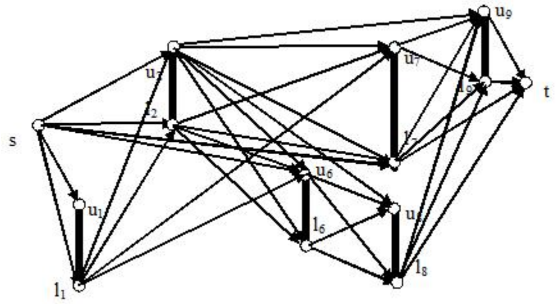

Figure 2. Graph *G* for initial conditions

$$f(v_k, v_{k+1}) = min\{f(v_r, v_k) + \alpha((v_r, v_k), (v_k, v_{k+1}))\}, \forall(v_r, v_k) \in E, \qquad (3)$$

Since, the edges of graph start from the vertex *vs*, the function *f* take a value of zero. Then the application of this algorithm lets to obtain solution *Fmin* on the (*s*, *t*) – path:

$$F\min = \min\{ f(\nu_r,\nu_t)\}, \forall(\nu_r,\nu_t) \in E.$$

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