Supplement to Shaping a Swarm With a Shared Control Input Using Boundary Walls and Wall Friction

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***Abstract*—Includes algorithms and equations too lengthy for main paper, but potentially useful for the community.**

Algorithm 1 GenerateDesired$y$-spacing(s_1, s_2, e_1, e_2, L)

Require: Knowledge of starting (s_1, s_2) and ending (e_1, e_2) positions of two robots. $(0, 0)$ is bottom corner, s_1 is rightmost robot, L is length of the walls. Current position of the robots are (r_1, r_2).

Ensure: $r_{1x} - r_{2x} \equiv s_{1x} - s_{2x}$

$\Delta s_y \leftarrow s_{1y} - s_{2y}$
$\Delta e_y \leftarrow e_{1y} - e_{2y}$
$r_1 \leftarrow s_1$, $r_2 \leftarrow s_2$
if $\Delta e_y < 0$ **then**
    $m \leftarrow (L - \max(r_{1y}, r_{2y}), 0)$ ▷ Move to top wall
else
    $m \leftarrow (-\min(r_{1y}, r_{2y}), 0)$ ▷ Move to bottom wall
end if
$m \leftarrow m + (0, -\min(r_{1x}, r_{2x}))$ ▷ Move to left
$r_1 \leftarrow r_1 + m$, $r_2 \leftarrow r_2 + m$ ▷ Apply move
if $\Delta e_y - (r_{1y} - r_{2y}) > 0$ **then**
    $m \leftarrow (\min(|\Delta e_y - \Delta s_y|, L - r_{1y}), 0)$ ▷ Move top
else
    $m \leftarrow (-\min(|\Delta e_y - \Delta s_y|, r_{1y}), 0)$ ▷ Move bottom
end if
$m \leftarrow m + (0, \epsilon)$ ▷ Move right
$r_1 \leftarrow r_1 + m$, $r_2 \leftarrow r_2 + m$ ▷ Apply move
$\Delta r_y = r_{1y} - r_{2y}$
if $\Delta r_y \equiv \Delta e_y$ **then**
    $m \leftarrow (e_{1x} - r_{1x}, e_{1y} - r_{1y})$
    $r_1 \leftarrow r_1 + m$, $r_2 \leftarrow r_2 + m$ ▷ Apply move
    return (r_1, r_2)
else
    return GenerateDesired$y$-spacing(r_1, r_2, e_1, e_2, L)
end if