ESTIMATION OF SOLUTION OF EULER-LAGRANGE EQUATION IN THE BOUNDARY LAYER

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Let's define a ratio between extremals an extremal problem for functional (1) ([1], p.34, formula (1.1.1)) and a problem (2) ([1], p.39, formula (1.2.1)) under $t \in \Delta$:

$$\Phi = \int_0^1 L\big(u(t), \dot{u}(t)\big)\, dt \ , \tag{1}$$

$$\psi_\Delta = \min_{\tilde{u} \in \tilde{U}} \int_0^\delta L_\Delta(\, t, \tilde{u}(t), \dot{\tilde{u}}(t)\,)\, dt \,, \tag{2}$$

where the set $\tilde{U}$ is defined by next expression:

$$\tilde{U} = \left\{ \tilde{u} \,\middle|\, \tilde{u} \in C^1(\Delta, IR)\,,\ \ \Delta = [0,\delta]\,,\ \ \delta << 1\,,\ \ \tilde{u} = u - u_0 - \dot{u}_0\, t \right\}. \tag{3}$$

Let:

- a function $u(t)$ is the solution of the problem for functional (1),
- a function $\tilde{u}(t)$ is the solution of the problem (2).

From expression (3) it follows

$$\left| u - \tilde{u} \right| = \left| u_0 + \dot{u}_0 t \right| \le \left| u_0 \right| + \left| \dot{u}_0 \right| \delta \le \left| u_0 \right| + \left| \dot{u}_0 \right| \ ,$$

$$\left| \dot{u} - \dot{\tilde{u}} \right| = \left| \dot{u}_0 \right| \ .$$

As a result we obtain the estimation

$$\left\| u - \tilde{u} \right\|_1 \le \left| u_0 \right| + \left| \dot{u}_0 \right| \ .$$

REFERENCES

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