Contribution ID: 71 Type: Oral

On controllability problems for the heat equation controlled by the Dirichlet boundary condition

Consider the following control system:

```
w_t = w_{xx}, x \in (0, +\infty), t \in (0, T),

w(0, \cdot) = u, t \in (0, T),

w(\cdot, 0) = w^0, x \in (0, +\infty),
```

where T>0 is a constant, w^0 is a given function, $u\in L^\infty(0,T)$ is a control. The control system is considered in Sovolev spaces.

An initial state w^0 of control system (1)-(3) is said to be null-controllable in a given time T>0 if we can find a control $u\in L^\infty(0,T)$ such that the state of the solution to the control system at t=T satisfies the condition $w(\cdot,T)=0$. An initial state w^0 of control system (1)-(3) is said to be approximately controllable to a target state w^T in a given time T>0 if for each neighbourhood of a target state w^T there exists a control $u\in L^\infty(0,T)$ such that the end state of the solution to the control system (at t=T) belongs to this neighbourhood of w^T .

We prove that any initial state of the control system (except the zero one) is not null-controllable in a given time T > 0.

We also prove that each initial state of the control system is approximately controllable to any target state in a given time T > 0.

The results are illustrated by examples.

The results on controllability of the heat equation controlled by the Dirichlet boundary condition was published in [1-3].

References

- [1] L. Fardigola and K. Khalina, Reachability and controllability problems for the heat equation on a half-axis, J. Math. Phys. Anal. Geom. 15 (2019), 57-78.
- [2] L. Fardigola and K. Khalina, Controllability problems for the heat equation with variable coefficients on a half-axis, ESAIM Control Optim. Calc. Var. 28 (2022), Art. No. 41.
- [3] L. Fardigola and K. Khalina, Controllability problems for the heat equation in a half-plane controlled by the Dirichlet boundary condition with a point-wise control, J. Math. Phys. Anal. Geom. 18 (2022), 75-104.

Primary authors: KHALINA, Kateryna (B. Verkin Institute for Low Temperature Physics and Engineering of the National Academy of Sciences of Ukraine); FARDIGOLA, Larissa (B. Verkin Institute for Low Temperature Physics and Engineering of the National Academy of Sciences of Ukraine)

Presenter: FARDIGOLA, Larissa (B. Verkin Institute for Low Temperature Physics and Engineering of the National Academy of Sciences of Ukraine)

Session Classification: MATHEMATICS

Track Classification: MATHEMATICS