



Jugowice, 11th–15th September 2017

DYNAMICS OF THE SLOW/FAST ATRIOVENTRICULAR NODAL REENTRANT TACHYCARDIA MODEL

Beata Jackowska–Zduniak ¹

¹ Faculty of Applied Informatics and Mathematics, Warsaw University of Life Sciences
ul. Nowoursynowska 159, Warszawa

¹ beata_jackowska_zduniak@sggw.pl

ABSTRACT

A proposed model consisting of two coupled van der Pol equations is considered as a description of the heart's action potential. System of ordinary differential equations with time delay is used to recreate pathological behaviour in the heart's conducting system such as slow/fast and slow/slow type of atrio-ventricular nodal re-entrant tachycardia (AVNRT). In our research, introducing the feedback loops and couplings entails the creation of waves which can correspond to the re-entry waves occurring in the AVNRT. Our main aim is to study the influence of feedback and delay which occur in these pathological modes. We present numerical analysis of the model.

REFERENCES

- [1] D. G. Katritsis and M. E. Josephson: *Classification of electrophysiological types of atrioventricular nodal re-entrant tachycardia: a reappraisal.*, *Europace* **15** (2013), 1231-1240.
- [2] K. Malaczynska and K. Blaszczyk: *Atrioventricular nodal reentrant tachycardia*, Polish review of the Cardiology **14** (2012), 196-203.
- [3] B. Dabrowska and P. Gajewski: *Postepowanie u chorych z nadkomorowymi zaburzeniami rytmu* Wytyczne American College of Cardiology, American Heart Association European Society of Cardiology, *Medycyna Praktyczna* **6** (2004), 1-62.
- [4] R.A. Freedman and J.W. Mason: *Sustained ventricular tachycardia, clinical aspects. Cardiac Pacing and Electrophysiology.*, Third Edition, Philadelphia: W. B. Sanders Co., 1991.
- [5] W. G. Stevenson: *Exploring postinfarction reentrant ventricular tachycardia with entertainment mapping*, *J. Am. Coll. Cardiol* **29** (1997), 1180-1189.
- [6] M. Shenasa: *Electrocardiography of complex arrhythmias*, Elsevier, 2014.
- [7] K. Malaczynska-Rajpold and K. Blaszczyk: *Atrioventricular nodal reentrant tachycardia*, *Polski Przegląd Kardiologiczny* **14(3)** (2012), 1507-5540.
- [8] B. Jackowska-Zduniak, M. Bodnar, and U. Foryś: *A modified van der Pol equation with delay in a description of the heart action.*, *Int. J. Appl. Math. Comput. Sci.* **24** (2014), 853-863.
- [9] K. Grudziński: *Modeling the Electrical Activity of the Heart Conduction*, thesis (2007).