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### **Automated theorem proving for Euclidean geometry**

In this talk we will present a method of automated theorem proving for Euclidean geometry, known as the area method. This method, due to Shang-Ching Chou (Chou, 1994), is applied to constructive geometry statements, which are defined in the following way:

Definition 1. A constructive geometry statement is a list  $S = (C_1, C_2, \dots, C_m, G)$ , where  $C_i$ , for  $1 \leq i \leq m$ , are elementary construction steps, and the conclusion of the statement,  $G$  is of the form  $E_1 = E_2$ , where  $E_1$  and  $E_2$  are polynomials in geometric quantities of the points introduced by the steps  $C_i$ . In each of  $C_i$ , the points used in the construction steps must be already introduced by the preceding construction steps [3, p. 499].

We present automated proofs of some celebrated theorems, including Thales' theorem (Euclid, *Elements*, VI. 2). Our proofs are generated by the program WinGCLC. Furthermore, we will address some questions concerning the educational aspects of automated theorem proving.

#### References

- [1.] Chou S. C. , Gao X. S., Zhang J. Z., *Machine Proofs in Geometry*, World Scientific, Singapore 1994.
- [2.] Euclid, *Elements*, edited, and provided with a modern English translation, by R. Fitzpatrick; <http://farside.ph.utexas.edu/Books/Euclid/Elements.pdf>.
- [3.] Janičić P., Narboux J., Quaresma P., The area method, *Journal of Automated Reasoning* 48, 4 (2012), 489 - 532.

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