OpenGeoProver Output for conjecture "Chou 173 (Orthocenter Theorem)"

Wu's method used

March 4, 2012

1 Validation of Construction Protocol

Construction steps:

- Free point A
- Free point B
- Free point C
- Line b through two points C and A
- Line c through two points A and B
- Line hb through point B perpendicular to line b
- Line hc through point C perpendicular to line c
- Intersection point H of point sets hb and hc
- Line a through two points B and C
- Line ha through two points A and H

Theorem statement:

- Line a is perpendicular to line ha

Validation result: Construction protocol is valid.

2 Transformation of Construction Protocol to algebraic form

Transformation of Construction steps

2.1 Transformation of point A:

- Point A has been assigned following coordinates: (0, 0)

2.2 Transformation of point B:

- Point B has been assigned following coordinates: $(0,\ u_1)$

2.3 Transformation of point C:

- Point C has been assigned following coordinates: $(u_2,\ u_3)$

2.4 Transformation of point H:

- Point H has been assigned following coordinates: $(x_1,\ x_2)$
- Polynomial that point H has to satisfy is:

$$p \quad = \quad u_3x_2 + u_2x_1 - u_3u_1$$

- Processing of polynomial

$$p \quad = \quad u_3x_2 + u_2x_1 - u_3u_1$$

Info: Polynomial

$$p \quad = \quad u_3x_2 + u_2x_1 - u_3u_1$$

added to system of polynomials that represents the constructions

- New polynomial added to system of hypotheses
- Polynomial that point H has to satisfy is:

$$p \quad = \quad x_2 - u_3$$

- Processing of polynomial

$$p \quad = \quad x_2 - u_3$$

Info: Will try to rename Y coordinate of point H

Info: Y coordinate of point H renamed by independent variable u_3

- Point H has been renamed. Point H has been assigned following coordinates: $(x_1,\ u_3)$
- Repeating instantiation of first condition of this point, after its coordinate has been renamed
- Polynomial that point H has to satisfy is:

$$p \quad = \quad u_2x_1 + (u_3^2 - u_3u_1)$$

- Processing of polynomial

$$p \quad = \quad u_2x_1 + (u_3^2 - u_3u_1)$$

Info: Polynomial

$$p \quad = \quad u_2x_1 + (u_3^2 - u_3u_1)$$

added to system of polynomials that represents the constructions

- New polynomial added to system of hypotheses

Transformation of Theorem statement

- Polynomial for theorem statement:

$$p \quad = \quad u_2 x_1 + (u_3^2 - u_3 u_1)$$

Time spent for transformation of Construction Protocol to algebraic form

- 0.03 seconds

3 Invoking the theorem prover

The used proving method is Wu's method.
The system is already triangular.

$$p_1 \quad = \quad u_2 x_1 + (u_3^2 - u_3 u_1)$$

4 Final Remainder

4.1 Final remainder for conjecture Chou 173 (Orthocenter Theorem)

Calculating final remainder of the conclusion:

$$g \quad = \quad u_2 x_1 + (u_3^2 - u_3 u_1)$$

with respect to the triangular system.

1. Pseudo remainder with p_1 over variable x_1:

$$g \quad = \quad 0$$

5 Prover results

Status: Theorem has been proved.

Space Complexity: The biggest polynomial obtained during prover execution contains 2 terms.

Time Complexity: Time spent by the prover is 0.01 seconds.

6 NDG Conditions

NDG Conditions in readable form

- Points B and C are not identical

Time spent for processing NDG Conditions

- 0.05 seconds