

Supplement op Bijmens Doom

Citation for published version (APA):

Meiden, van der, W. (1975). *Supplement op Bijmens Doom*. (Eindhoven University of Technology : Dept of Mathematics : memorandum; Vol. 7502). Technische Hogeschool Eindhoven.

Document status and date:

Gepubliceerd: 01/01/1975

Document Version:

Uitgevers PDF, ook bekend als Version of Record

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Onderafdeling der Wiskunde

Memorandum 1975-02

mei 1975

Supplement op Bijmens Doom

door

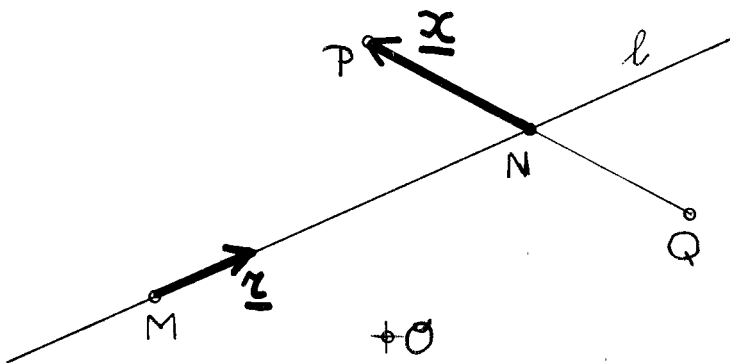
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In een vectorruimte \mathbb{R}_3 wordt een draaiing D om een as l (richtingsvector \underline{r} , met $|\underline{r}| = 1$) over een hoek α (in rechtse richting, gezien in de richting van \underline{r}) volgens een bekende formule van Euler (vergelijk [1], p. 242) in moderne notatie gegeven door

$$D\underline{x} = \underline{x} \cos \alpha + \underline{r} \times \underline{x} \sin \alpha + \underline{r} (1 - \cos \alpha) (\underline{r}, \underline{x}) .$$

Wij moeten dit aanpassen aan de affiene situatie waarin de Doorn verkeert ([2]). Zijn O de oorsprong, en M het middelpunt, P en Q twee hoekpunten van



de Doorn en N het midden van PQ . Omdat P en Q op de bijbehorende bol liggen is $MN \perp PQ$.

$$N = \frac{P + Q}{2} .$$

\underline{r} is een eenheidsvector langs MN , dus

$$\underline{r} = \frac{N - M}{|N - M|} = \frac{\frac{P + Q}{2} - M}{\left| \frac{P + Q}{2} - M \right|}$$

$$\underline{x} = P - N = P - \frac{P + Q}{2} = \frac{P - Q}{2} .$$

Met deze afspraken is dan

$$\begin{aligned} P' &= N + \underline{x} \cos \alpha + \underline{r} \times \underline{x} \sin \alpha + \underline{r} (1 - \cos \alpha) (\underline{r}, \underline{x}) = \\ &= \frac{P + Q}{2} + \underline{x} \cos \alpha + \underline{r} \times \underline{x} \sin \alpha + \underline{r} (1 - \cos \alpha) (\underline{r}, \underline{x}) . \end{aligned} \quad \square$$

Opmerking. $\underline{r} \times \underline{x}$ is het vectorproduct van \underline{r} en \underline{x} ; als

$$\underline{r} = \begin{pmatrix} p \\ q \\ r \end{pmatrix} \text{ en } \underline{x} = \begin{pmatrix} x \\ y \\ z \end{pmatrix}$$

dan is

$$\underline{r} \times \underline{x} = \begin{pmatrix} qz - ry \\ rx - pz \\ py - qx \end{pmatrix} .$$

$(\underline{r}, \underline{x})$ is het inwendig product,

$$(\underline{r}, \underline{x}) = px + qy + rz .$$

□

Literatuur.

- [1] Mirsky, L.; An introduction to linear Algebra. Oxford Univ. Pr., 1955.
- [2] Meiden, W. van der; Bijens Doom. Memorandum 1974-12, Onderafdeling der Wiskunde, THE, 1974.