Zeitschrift: L'Enseignement Mathématique
Herausgeber: Commission Internationale de l'Enseignement Mathématique
Band: 51 (2005)
Heft: 1-2: L'enseignement mathématique

Artikel: Counting solutions of perturbed harmonic map equations
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Bibliographie
DOI: https://doi.org/10.5169/seals-3588

$\operatorname{Ker} T$. Then, using the orthonormal basis $\{f_1, \dots, f_n\}$ of E and the elements $\{h_{k+1}, \dots, h_n\} \in (\operatorname{Ker} T)^{\perp}$ as in Example A.2, we see that

$$\begin{aligned}\widetilde{\mu}_T &= \bigwedge_{i=1}^{k}(e_i,0,0) \wedge \bigwedge_{l=k+1}^{n}(e_l, Te_l, 0) \wedge \bigwedge_{j=1}^{n}(0,0,e_j) \\ &= c \cdot \bigwedge_{i=1}^{k}(e_i,0,0) \wedge \bigwedge_{r=k+1}^{n}(h_r, f_r, 0) \wedge \bigwedge_{s=1}^{n}(0,0,f_s)\,,\end{aligned}$$

where

$$c = \det(\langle Te_l, f_r\rangle_{l,r=k+1}^{n}) \cdot \det(\langle e_j, f_s\rangle_{j,s=1}^{n})\,.$$

In particular, $k = 0$ in the above formula whenever T is invertible, so that the expression then simplifies to $c = \det(T)$.

To recapitulate the above, we have shown that there is a natural trivialization of $\mathcal{D}et(\mathcal{T})$ determined by the canonical generator of $\mathcal{D}et(\mathcal{T}_0)$, which when evaluated at an invertible map $T \in L(E,E)$ corresponds to the element

$$\mu_T = \det(T)\, 1 \otimes 1 \in \mathcal{D}et(\mathcal{T}_T)\,. \tag{A.8}$$

This explains the name determinant line bundle for the bundle $\mathcal{D}et(\mathcal{T})$ and concludes our discussion of Example A.7.

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(Reçu le 2 avril 2004)

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