

**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>

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

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

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  $\mathcal{D}\text{et}(\mathcal{T})$  determined by the canonical generator of  $\mathcal{D}\text{et}(\mathcal{T}_0)$ , which when evaluated at an invertible map  $T \in L(E, E)$  corresponds to the element

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

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

## REFERENCES

- [CMS] CIELIEBAK, K., I. MUNDET I RIERA and D. SALAMON. Equivariant moduli problems, branched manifolds and the Euler class. *Topology* 42 (2003), 641–700.
- [ES] EELLS, J. and J. H. SAMPSON. Harmonic mappings of Riemannian manifolds. *Amer. J. Math.* 86 (1964), 109–160.
- [Ha] HARTMAN, P. On homotopic harmonic maps. *Canad. J. Math.* 19 (1967), 673–687.
- [HW] HUREWICZ, W. and H. WALLMAN. *Dimension Theory*. Princeton University Press, 1948.
- [Jo] JOST, J. *Riemannian Geometry and Geometric Analysis*. Springer-Verlag, 1995.
- [KKS1] KAPPELER, T., S. B. KUKSIN and V. SCHROEDER. Perturbations of the harmonic map equation. *Commun. Contemp. Math.* 5 (2003), 629–669.
- [KKS2] —— Poincaré inequalities for maps with target manifold of negative curvature. *Preprint series*, Institute of Mathematics, University of Zurich, 2002, to appear in *Moscow J. of Math.*
- [Ko] KOKAREV, G. On the compactness property of the quasilinearly perturbed harmonic map equation. Preprint, 2003.

- [Ku] KUJSIN, S. B. Double-periodic solutions of nonlinear Cauchy-Riemann equations. *Comm. Pure Appl. Math.* 49 (1996), 639–676.
- [La] LANG, S. *Differential and Riemannian Manifolds*. Springer-Verlag, Graduate Texts in Mathematics 160, 1995.
- [Me] MEYER, W. Kritische Mannigfaltigkeiten in Hilbertmannigfaltigkeiten. *Math. Ann.* 170 (1967), 45–66.
- [Pa] PALAIS, R. S. *Foundations of Global Non-linear Analysis*, Benjamin Co., New York, 1968.
- [Sal] SALAMON, D. *Spin Geometry and Seiberg-Witten Invariants*. Book in preparation.
- [Sam] SAMPSON, J. H. Some properties and applications of harmonic mappings. *Ann. Sci. École Norm. Sup.* (4) 11 (1978), 211–228.
- [SY] SCHOEN, R. and S. T. YAU. Compact group actions and the topology of manifolds with non-positive curvature. *Topology* 18 (1979), 361–380.
- [Sm] SMALE, S. An infinite dimensional version of Sard’s theorem. *Amer. J. Math.* 87 (1965), 861–866.
- [Tr] TROMBA, A. The Euler characteristic of vector fields on Banach manifolds and a globalization of Leray-Schauder degree. *Adv. in Math.* 28 (1978), 148–173.
- [Ya] YAMADA, S. On the ranks of harmonic maps. *Comm. Partial Differential Equations* 23 (1998), 1969–1993.

(Reçu le 2 avril 2004)

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