ADDENDUM TO “CONFORMAL COCHAINS”

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The purpose of this note is to provide further details for a key step in the proof of the main result of Theorem 7.2 of [W], where the author states that the described sequence of combinatorial period matrices converges to the Riemann period matrix of the surface.

The limit in equation (3), line 11, does not follow from Lemma 7.1 and analysis alone, since the convergence in Lemma 7.1 is with respect to the L^2 -norm, and integration is not a bounded operator on smooth forms with respect to this norm. Nevertheless, the limit in (3) holds since we are considering smooth differential forms that are *closed*. We state this as a lemma below.

Lemma. *Let ω_n be a sequence of smooth closed differential forms on a closed Riemannian manifold which converge in L^2 to a smooth form ω . Then for any cycle c , the sequence $\int_c \omega_n$ converges to $\int_c \omega$.*

Proof. Considering the Hodge decomposition of differential forms and the Stokes’ theorem, we see that $\int_c \omega_n$ depends only on the harmonic component h_n of ω_n , and similarly $\int_c \omega$ depends only on the harmonic component h of ω . Integration along the cycle c is a linear function on the space of harmonic forms, which by deRham’s theorem is finite dimensional since M is closed. Therefore, this linear function is continuous, and since h_n converges to h , we have that $\int_c h_n$ converges to $\int_c h$, completing the proof. $\square$

REFERENCES

- [W] Scott O. Wilson, *Conformal cochains*, Trans. Amer. Math. Soc. **360** (2008), no. 10, 5247–5264, DOI 10.1090/S0002-9947-08-04556-X. MR2415073 (2010c:57034)

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