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Kyoto University
ON THE KOTTWITZ-SHELSTAD NORMALIZATION OF TRANSFER FACTORS FOR AUTOMORPHIC INDUCTION FOR GLₙ
(JOINT WORK WITH K. HIRAGA)

ATSUSHI ICHINO

This note is a report on a joint work with Kaoru Hiraga. Details will appear elsewhere.

Automorphic induction for GLₙ over a p-adic field is an example of endoscopic transfer and its character identity was established by Henniart and Herb [2], up to a constant. We discuss a relation of this constant to the Kottwitz-Shelstad transfer factor [5], in particular, to the normalization using ε-factors.

Let F be a non-archimedean local field of characteristic zero. Let $G = GL_n(F)$ and $a \in H^1(W_F, Z(\hat{G}))$, where $W_F$ is the Weil group of $F$ and $Z(\hat{G})$ is the center of the dual group of $G$. Let $(H, \mathcal{H}, s, \xi)$ be an endoscopic data for $(G, \text{id}, a)$ (see [5]). Then we have a map

\[
\text{Tran}_H^G : \left\{ \text{(stable) invariant distributions on } H \right\} \rightarrow \left\{ \text{twisted invariant distributions on } G \right\}
\]

defined as follows.

Let $\omega$ be the character of $F^\times$ associated to $a$. We write $\omega(g) = \omega(\det g)$ for $g \in G$. For a (strongly) regular semisimple element $\gamma \in G$ such that $G_\gamma \subset \ker \omega$ and $f^G \in C^\infty_c(G)$, put

\[
O^\omega_\gamma(f^G) = \int_{G_\gamma \backslash G} \omega(g)f^G(g^{-1}\gamma g) \, dg,
\]

where $G_\gamma$ is the centralizer of $\gamma$ in $G$. Similarly, for a (strongly) $G$-regular semisimple element $\gamma_H \in H$ and $f^H \in C^\infty_c(H)$, put

\[
O_{\gamma_H}(f^H) = \int_{H_{\gamma_H} \backslash H} f^H(h^{-1}\gamma_H h) \, dh,
\]

where $H_{\gamma_H}$ is the centralizer of $\gamma_H$ in $H$. Here we choose suitable Haar measures on $G$, $G_\gamma$, $H$, and $H_{\gamma_H}$. By a result of Waldspurger [7], for
each $f^G \in C_c^\infty(G)$, there exists $f^H \in C_c^\infty(H)$ such that

$$O_{\gamma_H}(f^H) = \sum_\gamma \Delta(\gamma_H, \gamma)O_{\gamma}^\omega(f^G)$$

for all $G$-regular semisimple elements $\gamma_H \in H$. Here the sum is taken over a set of representatives for the conjugacy classes of $\gamma \in G$ whose norm is $\gamma_H$ and $\Delta$ is a transfer factor (see [5]). Since $G$ is quasi-split over $F$, we can normalize $\Delta$ using Whittaker data and $\varepsilon$-factors as in [5, §5.3]. For an invariant distribution $D$ on $H$, we define a twisted invariant distribution $\text{Tran}_H^G(D)$ by

$$\text{Tran}_H^G(D)(f^G) = D(f^H)$$

for $f^G \in C_c^\infty(G)$.

On the other hand, by a result of Henniart and Herb [2], for each irreducible tempered admissible representation $\pi_H$ of $H$, there exist an irreducible tempered admissible representation $\pi$ of $G$ and a constant $c \in \mathbb{C}^\times$ such that $\pi \otimes \omega \cong \pi$ and

$$\text{Tran}_H^G(\Theta_{\pi_H}) = c \cdot \Theta_{\pi}^\omega.$$  

Here $\Theta_{\pi_H}(f^H) = \text{trace}(\pi_H(f^H))$ for $f^H \in C_c^\infty(H)$ and $\Theta_{\pi}^\omega(f^G) = \text{trace}(\pi(f^G) \circ \mathcal{A}_\omega)$ for $f^G \in C_c^\infty(G)$, where $\mathcal{A}_\omega : \pi \otimes \omega \rightarrow \pi$ is an isomorphism as vector spaces. Since $\pi$ is generic, we can normalize $\mathcal{A}_\omega$ using Whittaker functionals. By a result of Henniart and Lemair [3], the constant $c$ does not depend on the representations.

Our main result is as follows.

**Theorem 1.** We have

$$c = 1.$$  

**Remark 2.** An analogous result for $F = \mathbb{R}$ was proved by Henniart [1].

**References**


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