# BOUNDARY VALUE PROBLEMS WITH FRACTIONAL POWER SINGULARITIES

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Fractional coordinate transformations are useful to analyze microlocaly some boundary value problems, whose characteristic roots degenerate just on the boundary $\{x_1 = 0\}$. More precisely, let $P$ be an $m$-th order operator with real analytic coefficient, whose principal symbol $\sigma(P)(x, \zeta)$ has the following form in a neighborhood of $(0; 0, i\mathring{\eta}')$ :

$$\sigma(P)(x,\zeta) = \prod_{j=1}^{m} \bigl(\zeta_1 - x_1^{\nu}\alpha_j(x,\zeta')\bigr).$$

Here $\nu$ is a positive integer. Then, the singular coordinate transformation

$$y_1 = \left(\frac{x_1}{\nu+1}\right)^{1/(\nu+1)}, \quad y_j = x_j \ (j = 2, ..., n)$$

is useful to blow up the multiplicities of characteristic roots on $\{x_1 = 0\} = \{y_1 = 0\}$. Indeed, by using such transformations, Professor Y. Chiba succeeded in explicit constructions of microlocal solutions with pure singularities in the case that $\alpha_j(x, \zeta')$'s are pure-imaginary-valued and distinct from each other. We justify these fractional calculations in general microlocal boundary value problems for hyperfunctions; in particular, we can consider operators of the following type:

$$P(x_1^{1/(\nu+1)}, x', x_1\partial_{x_1}, \partial_{x'}).$$

Further we will give some applications to mixed boundary value problems which degenerate on the boundary.