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Configurations and Invariant Theory of Gauß-Manin Systems

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Let $f_0, f_1, \cdots, f_m$ be polynomials. The integral

$$\int \exp [f_0(x_1, \cdots, x_n)] \cdot f_1(x)^{\lambda_1} \cdots f_m(x)^{\lambda_m} dx_1 \cdots dx_n \tag{0.1}$$

satisfies Gauß-Manin system or holonomic system as a function of coefficients of $f_0, f_1, \cdots, f_m$. $GL_n(\boldsymbol{C})$ naturally acts on the space of coefficients, so that the above integral is written in invariant expression. This is a similar situation to *D. Mumford's geometric invariant theory* [1]. (See also [2] *in relation to Cayley forms*).

Let T, X be non-singular algebraic spaces of dimension n and l respectively. Let W be an analytic subset of codimension 1 such that the complement $V=T\times X-W$ is affine. We denote by ρ the natural projection:

$$\rho\colon V=T\times X-W \longmapsto T. \tag{0.2}$$

Then *by the isotopy theorem due to R. Thom* ([3], See [4] for further developments.) there exists a natural stratification of the morphism (V, T, ρ) satisfying the following property:

There exists an analytic subset T_0 of codimension 1 in T such that for arbitrary $t \in T-T_0$, the morphism

$$\rho\colon f^{-1}(T-T_0) \longmapsto T-T_0$$

is a topological fibre bundle whose fibre $V_t=\rho^{-1}(t)$ is non-singular:

We shall denote by $\Omega^p(V, F)$ the space of rational p-forms in a compactification of V and holomorphic in V with values in a sheaf F.

§1.

Let a $\mathfrak{gl}(m, \boldsymbol{C})$-valued rational 1-form in $T\times X$ which is holomorphic in V,

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