Working Group Discussion: Sept 13

Maciej: advertisement for workshop on ==Isocrystals==

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$$\boxed{12 - 16 \text{ Nov}}$$

$$X$$
$$\downarrow f \quad \text{gives isocrystal} \quad R^i_{f\, rig\, x} \, \mathcal{O}_{X/K} \circlearrowleft F$$
$$Y \nwarrow$$
$$\underset{\text{variety}}{\text{abelian}}$$

1. Following "Notes on isocrystals"
2. Tsuzuki's paper

Rel. Variation of hodge structures
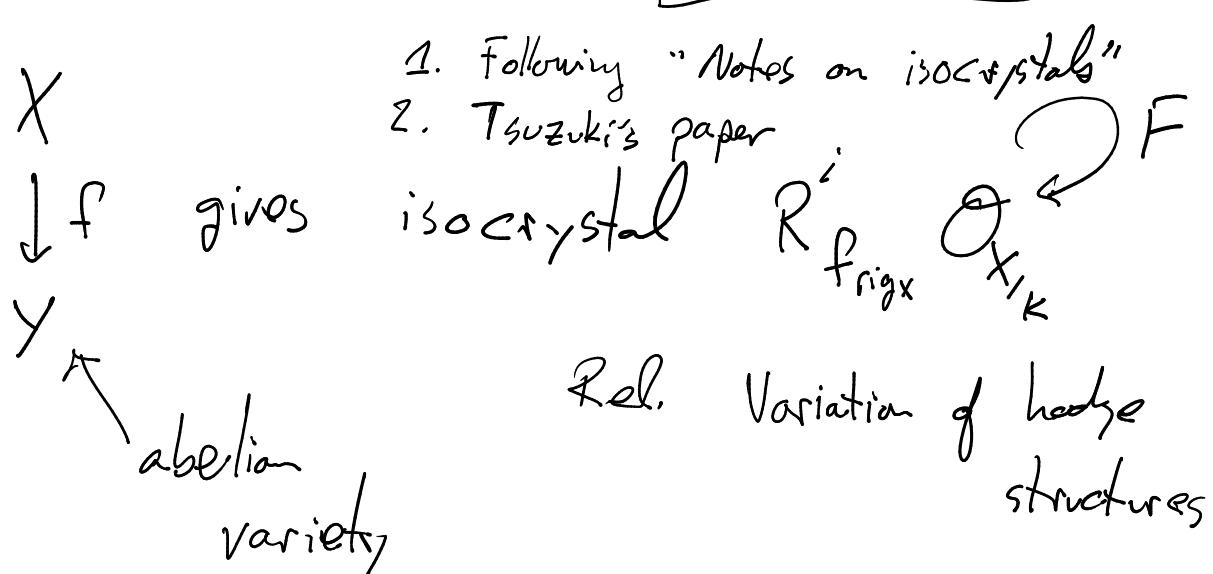
Secant Varieties
==Algebraic Vision==

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Paper: Lieblich - Van Meter

"Two Hilbert Schemes in Computer Vision"

Aholt - Sturmfels - Thomas

"A Hilbert scheme in computer vision"

Pinhole camera:

$$\mathbb{R}^3 \longrightarrow \mathbb{R}^2$$

linear map

$$\begin{array}{ccc} \mathbb{P}^3 & \longrightarrow & \mathbb{P}^2 \end{array}$$

$$\mathbb{C}^4 \longrightarrow \mathbb{C}^3$$

$$\mathbb{C}^4 \longrightarrow \mathbb{C}^3$$

Many cameras: $\mathbb{P}^3 \xrightarrow{(A_1, \dots A_n)} (\mathbb{P}^2)^n$

best case: centers distinct, non-colinear

$\longrightarrow \quad Bl_{(c_1, \dots c_n)} \mathbb{P}^3 \longrightarrow (\mathbb{P}^2)^n$

GIT $\quad (A_1^T, \dots A_n^T) \quad 4 \times 3n \quad$ matrix

$Gr(4, 3n) /\!\!/ (\mathbb{C}^*)^n \longleftarrow$ understand this! $\quad \in G(4, 3n)$

==Junior Learning Study Group==

Hartshorne Solvers

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==Junior Group "Rigidity"==

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Simpson's conjecture:

Understand notes from Fernando's lectures

Potential project: concrete

Show that certain rigid local systems are geometric

Local system rigid + local constraints satisfied $\Longrightarrow$ geometric

e.g. $\quad z\left(z\frac{d}{dz} + \alpha_1\right) \dots \left(z\frac{d}{dz} + \alpha_r\right) + \left(z\frac{d}{dz} + \beta_1\right) \dots \left(z\frac{d}{dz} + \beta_r\right)$

$$= L_{\bar{\alpha}, \bar{\beta}}$$

Local monodromy $\quad \exp(2\pi i \alpha_j)$
$$\exp(2\pi i \beta_j)$$

$$\alpha_i = \frac{\#}{N} \quad \beta_i = \frac{\#}{N}$$

$$C_N = \{ x^N + y^n = 1 \}$$

$$X_Z = \{ x_1 \cdots x_r = z \} \subset C_N \times \cdots \times C_n \circlearrowleft G^r$$

$$\underbrace{}_{\times r}$$

$$\overset{G^{r-1}}{H^{r-1}}(X_Z) = \bigoplus H^{r-1, \chi}(X_Z) \qquad \overset{"}{\{ \frac{Z}{NZ} \times \cdots \times \frac{Z}{NZ} \}}$$

$$G^r$$

<u>Show this is hypergeometric</u>

Find correspondence between χ and $\vec{\alpha}, \vec{\beta}$

This should give a new proof on
recent results calculating Hodge nos
for hypergeometric eqn's

<mark>Complex Contact Manifolds</mark>

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X complex mfd of dim $2n+1$

$$F \subset T_X \qquad F \text{ as "not integrable as possible"}$$
$$\text{rk } F = 2n$$

Are there good generalizations?
What about working over fields besides $\mathbb{C}$?

Holonomic D-modules
and Positive Characteristic
(Kontsevich 2009)

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Senior Reading Group

— support of a D-module

Conj: Support is independent of characteristic when
D-module comes from char 0.

Parameter Spaces
for Rational Curves

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$V \subset k[x,y]$, $(n+1)$-dimensional gives rise
to curve $X(V) = \text{Proj} \bigoplus_{k \geq 0} V^k \subset \mathbb{P}^n$.

What can we say about the stratification
of $Gr(n+1, k[x,y]_1)$ by arithmetic
genus?