

K3 surfaces and log del Pezzo surfaces of index three

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We want to classify log del Pezzo surfaces of index k .

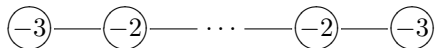
History of classification

- $k = 1$: classical result
- $k = 2$: Alexeev and Nikulin, Nakayama

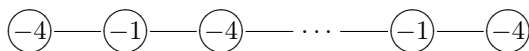
Generalize the idea of [AN] to the $k = 3$ case!

Review of [AN] ($k = 2$ case)

- Smooth Divisor Theorem
 $\exists C \in |-2K_Z|$ s.t. C : smooth curve and $C \not\cong$ singularities.
- Right resolution
In general, we get the following dual graph by the minimal resolution.



$\uparrow$: blow up at all intersection points



- Classification of non-symplectic involutions on $K3$ surfaces by Nikulin

We get a correspondence between $K3$ surfaces with a non-symplectic involution and log del Pezzo surfaces of index 2.

Main Theorem ($k = 3$ case)

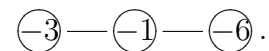
There exists a correspondence between $K3$ surfaces with a non-symplectic automorphisms of order 3 and log del Pezzo surfaces of index 3.

- Multiple Smooth Divisor Property

$\exists 2C \in |-3K_Z|$ s.t. C : smooth curve and $C \not\cong$ singularities.

- Right resolution

It is a successive union of the unit chain



- Classification of non-symplectic automorphisms of order 3 on $K3$ surfaces by Artebani and Sarti, **Taki** (independently)

There exists a log del Pezzo surface of index 3 which does not satisfy **MSDP**. (ex. $\mathbb{P}(1, 1, 3)$) Thus the observation does not give the complete classification.

Example

