that may be obtained from $\mathbb{P}^2$ by a series of blow-ups and blow downs.

2. Rational Maps

Rational and Birational Maps

One of the basic geometric operations on algebraic varieties $V \subset \mathbb{P}^n$ is the projection

$$\pi_p : V \longrightarrow \mathbb{P}^{n-1}$$

of a variety V from a point $p \in \mathbb{P}^n$ not lying on V to a hyperplane. In Chapter 2 we saw that, if V is a curve, the map π_p is well-defined even in case p lies on V: π_p, defined a priori only on $V - \{p\}$, may be extended by mapping p to the image in $\mathbb{P}^{n-1}$ of the tangent line to V at p.

☞ See P216 (Chapter 2), and refer to P497 ✓

In general, however, if V has dimension greater than one and $p \in V$, the map π_p is not well-defined at, nor can it be extended over, the point p. This is not hard to see: for any point $q \in \mathbb{P}^{n-1} \cap T_p(V)$ in the image of the tangent plane to V at p there is a sequence $\{q_i\}$ of points on $V - \{p\}$ tending to p, such that $\pi_p(q_i)$ tends to q.