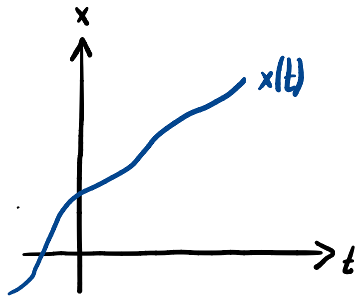
$$u_t(t,x)+v\,u_x(t,x)=w(t,x,u(t,x))$$
$$u(0,x)=g(x)\in C^1(\mathbb{R})$$

$\downarrow$

$(t,x(t))$ CURVE IN $\mathbb{R}^2$

$z(t)=u(t,x(t))$



$\downarrow$

$$z'(t)=u_t(t,x(t))+u_x(t,x(t))\,x'(t)$$
$$z(0)=u(0,x(0))=g(x(0))$$

$\downarrow$

$x'(t)=v(t,x(t))$.... CHARACTERISTIC

$w(t,x(t),u(t,x(t)))=w(t,x(t),z(t))$

$\downarrow$

$$x'(t)=v(t,x(t))$$
$$z'(t)=w(t,x(t),z(t))$$
$$z(0)=g(x(0)),\ x(0)\in\mathbb{R}.$$

$\downarrow$

v, w... CONTINUOUS

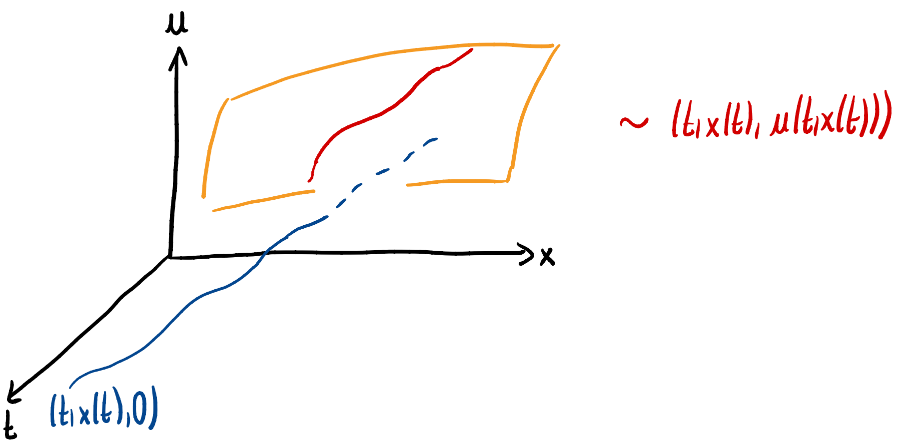
v_x, w_x, w_u... CONTINUOUS

$\downarrow$

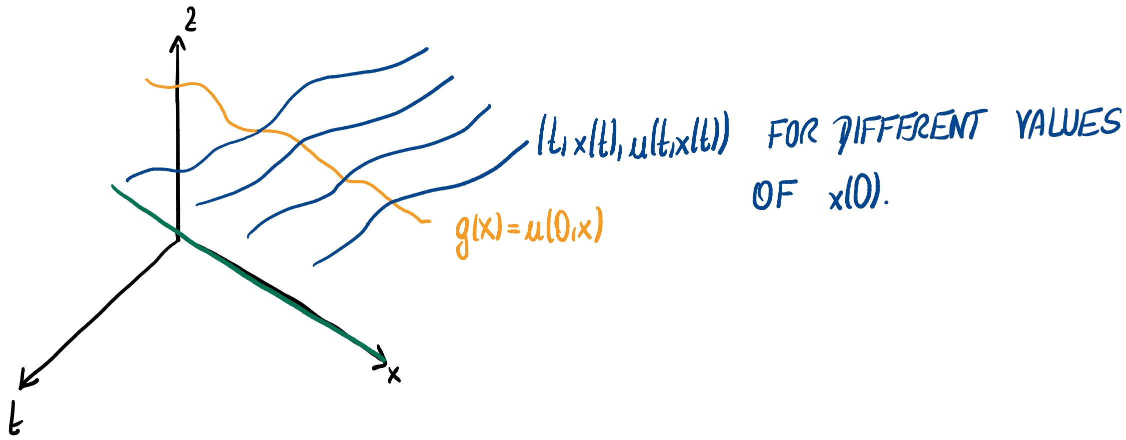
UNIQUE (LOCAL) SOLUTION $(x(t),z(t))$

$\downarrow$

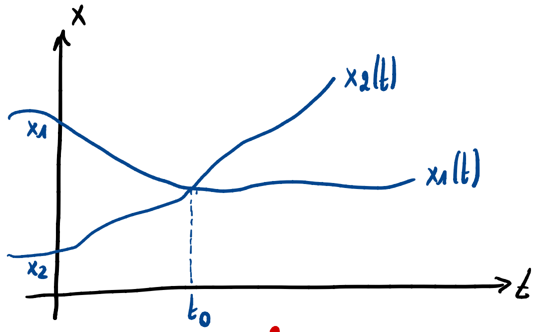
$u(t,x(t))=z(t)$ ... SOLUTION ALONG THE CURVE $(t,x(t))$



TO OBTAIN A SOLUTION ON ALL OF $\mathbb{R}^2$



PROBLEMATIC: CHARACTERISTICS CROSSING



$$z_1(t_0) = u(t_0, x_1(t_0)) \overset{?}{=} u(t_0, x_2(t_0)) = z_2(t_0)$$

$=$ → FINE

$\neq$ → CANNOT OBTAIN A GLOBAL CLASSICAL SOLUTION