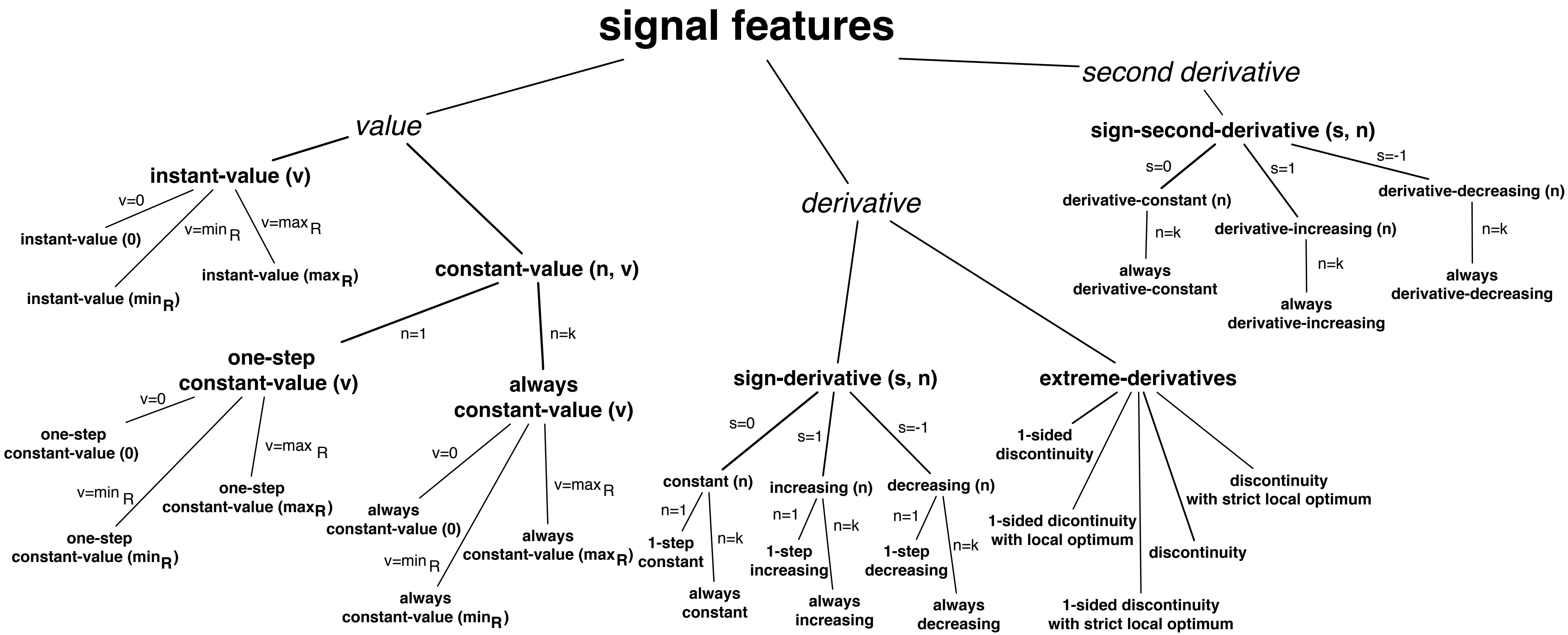
(a) Features Classification



(b) Formulas used in the feature functions

Left Derivative

$$lDer(sg,i) = \frac{sg(i\cdot\Delta t) - sg((i-1)\cdot\Delta t)}{\Delta t}$$

Right Derivative

$$rDer(sg,i) = \frac{sg((i+1)\cdot\Delta t) - sg(i\cdot\Delta t)}{\Delta t}$$

Left Derivative Sign

$$lds(sg,i) = \begin{cases} 0, & sg(i\cdot\Delta t) = sg((i-1)\cdot\Delta t) \\ 1, & sg(i\cdot\Delta t) > sg((i-1)\cdot\Delta t) \\ -1, & sg(i\cdot\Delta t) < sg((i-1)\cdot\Delta t) \end{cases}$$

Right Derivative Sign

$$rds(sg,i) = \begin{cases} 0, & sg(i\cdot\Delta t) = sg((i+1)\cdot\Delta t) \\ 1, & sg(i\cdot\Delta t) < sg((i+1)\cdot\Delta t) \\ -1, & sg(i\cdot\Delta t) > sg((i+1)\cdot\Delta t) \end{cases}$$

Local Optimum

$$locOpt(sg,i) = \begin{cases} 1, & lds(sg,i) \neq rds(sg,i) \\ 0, & Otherwise \end{cases}$$

Strict Local Optimum

$$strictLocOpt(sg,i) = \begin{cases} 1, & lds(sg,i) \neq 0 \wedge lds(sg,i) = -rds(sg,i) \\ 0, & Otherwise \end{cases}$$

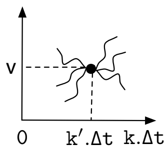
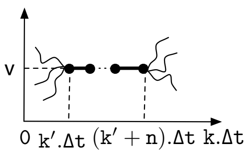
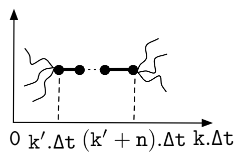
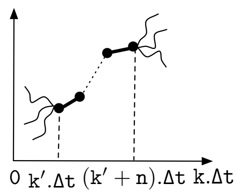
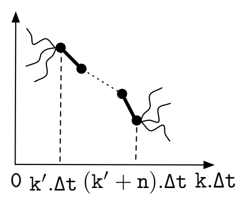
Second Derivative

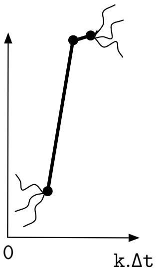
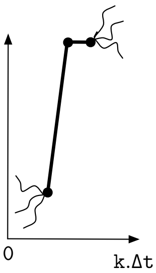
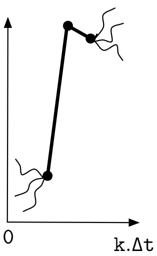
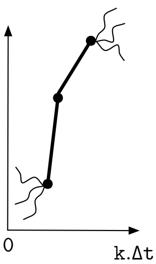
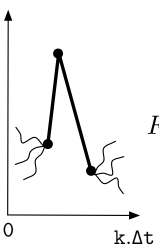
$$secDer(sg,i) = \frac{rder(sg,i) - lder(sg,i)}{2\cdot\Delta t}$$

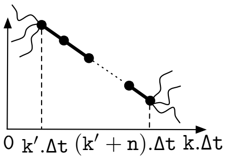
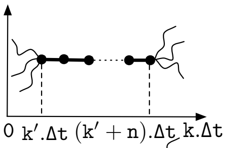
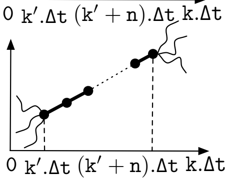
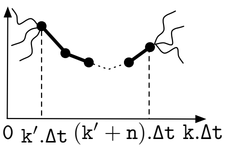
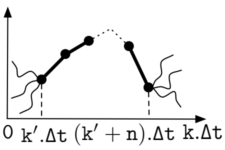
Second Derivative Sign

$$secDerSign(sg,i) = \begin{cases} 0, & lder(sg,i) = rder(sg,i) \\ 1, & lder(sg,i) < rder(sg,i) \\ -1, & lder(sg,i) > rder(sg,i) \end{cases}$$

(c) List of the feature functions

Feature Name	Signal Shape	Feature Function	Instances
Instant-Value (v)		$F_f(sg,v) = \min_{i=0}^{k} \lvert sg(i\cdot\Delta t) - v\rvert$	Instant-Value (0) Instant-Value (min_R) Instant-Value (max_R)
Constant-Value (n,v)		$F_f(sg,n,v) = \min_{i=n}^{k}(\sum_{j=i-n}^{i} \lvert sg(i\cdot\Delta t) - v\rvert)$	Constant-Value (1,0) Constant-Value (1,min_R) Constant-Value (1,max_R) Constant-Value (k,0) Constant-Value (k,min_R) Constant-Value (k,max_R)
Constant (n)		$F_f(sg,n) = \min_{i=n}^{k}(\sum_{j=i-n+1}^{i} \lvert lds(sg,i)\rvert)$	Constant (1) Constant (k)
Increasing (n)		$F_f(sg,n) = \max_{i=n}^{k}(\sum_{j=i-n+1}^{i} lds(sg,i))$	Increasing (1) Increasing (k)
Decreasing (n)		$F_f(sg,n) = \min_{i=n}^{k}(\sum_{j=i-n+1}^{i} lds(sg,i))$	Decreasing (1) Decreasing (k)

Feature Name	Signal Shape	Feature Function	? Instances
One-Sided Discontinuity		$F_f(sg) = \max_{i=1}^{K} \lvert lDer(sg,i) \rvert$	
One-Sided Discontinuity with Local Optimum		$F_f(sg) = \max_{i=1}^{K-1} (\lvert lDer(sg,i) \rvert \times locOpt(sg,i))$	
One-Sided Discontinuity with Strict Local Optimum		$F_f(sg) = \max_{i=1}^{K-1} (\lvert lDer(sg,i) \rvert \times strictLocOpt(sg,i))$	
Discontinuity		$F_f(sg) = \max_{i=1}^{K-1} (min(\lvert lDer(sg,i) \rvert, \lvert rDer(sg,i) \rvert))$	
Discontinuity with Strict Local Optimum		$F_f(sg) = \max_{i=1}^{K-1} (min(\lvert lDer(sg,i) \rvert, \lvert rDer(sg,i) \rvert) \times strictLocOpt(sg,i))$	

Feature Name	Signal Shape	Feature Function	Instances
Derivative Constant (n)	  	$F_f(sg,n) = \min_{i=n}^{k}(\sum_{j=i-n+1}^{i} \lvert secDerSign(sg,i)\rvert)$	Derivative Constant (k)
Derivative Increasing (n)		$F_f(sg,n) = \max_{i=n}^{k}(\sum_{j=i-n+1}^{i} secDerSign(sg,i))$	Derivative Increasing (k)
Derivative Decreasing (n)		$F_f(sg,n) = \min_{i=n}^{k}(\sum_{j=i-n+1}^{i} secDerSign(sg,i))$	Derivative decreasing (k)