Result Class Variables

Variables and their definitions for the 3 results classes are presented here. Detailed mathematical explanations and associated equations are available in the Methods Manuscript.

VCG Morphology Class (`VCG_Morphology.m`)

Variable	Description	Units
`TCRT`	Total Cosine R to T (range 0 - 1)	–
`TCRT_angle`	Angle from TCRT = acos(TCRT)	deg
`qrsloop_residual`	SVD variance from fitting QRS loop to a plane (0 = perfect fit) = $\texttt{qrs\_S3}^2$	–
`qrsloop_rmse`	RMSE for fit of QRS loop to best fit plane (0 = perfect fit)	mV
`qrsloop_roundness`	QRS loop roundness. 1 = perfect circle, larger values are increasingly elliptical = `qrs_S1`/`qrs_S2`	–
`qrsloop_area`	Area of QRS loop	mV
`qrsloop_perimeter`	Length of QRS loop projected into best fit plane	mV^2
`tloop_residual`	SVD variance from fitting T loop to a plane (0 = perfect fit) = $\texttt{t\_S3}^2$	–
`tloop_rmse`	RMSE for fit of T loop to best fit plane (0 = perfect fit)	mV
`tloop_roundness`	T loop roundness. 1 = perfect circle, larger values are increasingly elliptical = `t_S1`/`t_S2`	–
`tloop_area`	Area of T loop	mV
`tloop_perimeter`	Length of T loop projected into best fit plane	mV^2
`qrs_loop_normal`	Unit vector normal to best fit QRS loop plane	–
`t_loop_normal`	Unit vector normal to best fit T loop plane	–
`qrst_dihedral_ang`	Dihedral angle between best fit QRS loop and T loop planes	deg
`qrs_S1`	1st singular value of QRS loop	–
`qrs_S2`	2nd singular value of QRS loop	–
`qrs_S3`	3rd singular value of QRS loop	–
`t_S1`	1st singular value of T loop	–
`t_S2`	2nd singular value of T loop	–
`t_S3`	3rd singular value of T loop	–
`qrs_var_s1_total`	% of total variance made up by 1st QRS singular value	%
`qrs_var_s2_total`	% of total variance made up by 2nd QRS singular value	%
`qrs_var_s3_total`	% of total variance made up by 3rd QRS singular value	%
`t_var_s1_total`	% of total variance made up by 1st T singular value	%
`t_var_s2_total`	% of total variance made up by 2nd T singular value	%
`t_var_s3_total`	% of total variance made up by 3rd T singular value	%

VCG Calculation Class (`VCG_Calc.m`)

Variable	Description	Units
qrs_int	QRS duration	ms
qt_int	QT interval	ms
svg_x	X component of SVG = XQ_area + XT_area	mV·ms
svg_y	Y component of SVG = YQ_area + YT_area	mV·ms
svg_z	Z component of SVG = ZQ_area + ZT_area	mV·ms
sai_x	Area under the absolute value of the median X QRST complex	mV·ms
sai_y	Area under the absolute value of the median Y QRST complex	mV·ms
sai_z	Area under the absolute value of the median Z QRST complex	mV·ms
sai_qrst	SAI QRST = sai_x + sai_y + sai_z	mV·ms
sai_vm	Area under the absolute value of the median VM QRST complex	mV·ms
q_peak_mag	Magnitude of peak QRS vector	mV
q_peak_az	Azimuth of peak QRS vector	deg
q_peak_el	Elevation of peak QRS vector	deg
t_peak_mag	Magnitude of peak T wave vector	mV
t_peak_az	Azimuth of peak T wave vector	deg
t_peak_el	Elevation of peak T wave vector	deg
svg_peak_mag	Magnitude of the sum of peak QRS and peak T vectors (“peak SVG”)	mV
svg_peak_az	Azimuth of the “peak SVG” vector	deg
svg_peak_el	Elevation of the “peak SVG” vector	deg
q_area_mag	Magnitude of QRS area vector ([XQ_area, YQ_area, ZQ_area])	mV·ms
q_area_az	Azimuth of QRS area vector	deg
q_area_el	Elevation of QRS area vector	deg
t_area_mag	Magnitude of T-wave area vector [XT_area, YT_area, ZT_area]	mV·ms
t_area_az	Azimuth of T-wave area vector	deg
t_area_el	Elevation of T-wave area vector	deg
svg_area_mag	Magnitude of the SVG vector [svg_x, svg_z, svg_z]	mV·ms
svg_area_az	Azimuth of the SVG vector	deg
svg_area_el	Elevation of the SVG vector	deg
qrst_angle_area	Area (mean) QRST angle: 3D angle between area QRS and area T wave vectors	deg
qrst_angle_peak	Peak QRST angle: 3D angle between peak QRS and peak T wave vectors	deg
qrst_angle_peak_frontal	Projection of area QRST angle into frontal plane	deg
qrst_angle_area_frontal	Projection of peak QRST angle into frontal plane	deg
XQ_area	Area under median X QRS complex	mV·ms
YQ_area	Area under median Y QRS complex	mV·ms
ZQ_area	Area under median Z QRS complex	mV·ms
XT_area	Area under median X T wave	mV·ms
YT_area	Area under median Y T wave	mV·ms
ZT_area	Area under median Z T wave	mV·ms

Variable	Description	Units
XQ_peak	Value of median X QRS complex at time of maximum distance from origin	mV
YQ_peak	Value of median Y QRS complex at time of maximum distance from origin	mV
ZQ_peak	Value of median Z QRS complex at time of maximum distance from origin	mV
XT_peak	Value of median X T wave at time of maximum distance from origin	mV
YT_peak	Value of median Y T wave at time of maximum distance from origin	mV
ZT_peak	Value of median Z T wave at time of maximum distance from origin	mV
speed_max	Maximum speed across the entire VCG loop	mV/ms
speed_min	Minimum speed across the entire VCG loop	mV/ms
speed_med	Median speed across the entire VCG loop	mV/ms
time_speed_max	Time after QRS onset of maximum VCG speed	ms
time_speed_min	Time after QRS onset of minimum VCG speed	ms
speed_qrs_max	Maximum speed across the QRS VCG loop	mV/ms
speed_qrs_min	Minimum speed across the QRS VCG loop	mV/ms
speed_qrs_med	Median speed across the QRS VCG loop	mV/ms
time_speed_qrs_max	Time after QRS onset of maximum QRS speed	ms
time_speed_qrs_min	Time after QRS onset of minimum QRS speed	ms
speed_t_max	Maximum speed across the T wave loop	mV/ms
speed_t_min	Minimum speed across the T wave loop	mV/ms
speed_t_med	Median speed across the T wave loop	mV/ms
time_speed_t_max	Time after QRS onset of maximum T-wave speed	ms
time_speed_t_min	Time after QRS onset of minimum T-wave speed	ms
qrst_distance_area	Distance between the area QRS and area T vectors	mV
qrst_distance_peak	Distance between the area QRS and area T vectors	mV
vcg_length_qrs	Length of QRS VCG loop	mV
vcg_length_t	Length of T wave VCG loop	mV
vcg_length_qrst	Length of QRST VCG loop = vcg_length_qrs + vcg_length_t	mV
vm_tpeak_time	Time after QRS onset of peak of median VM Twave	ms
vm_tpeak_tend_abs_diff	Time difference between T wave peak and T wave end in median VM lead	ms
vm_tpeak_tend_ratio	Ratio between time of T wave peak and time of T wave end in median VM lead	–

Lead Morphology Class (`Lead_Morphology.m`)

[lead] refers to any of the 16 leads (L1, L2, L3, avR, avL, avF, V1-V6, X, Y, Z, VM)

Variable	Description	Units
`[lead]_r_wave`	Magnitude of R wave on median beat of `[lead]`	mV
`[lead]_s_wave`	Magnitude of S wave on median beat of `[lead]`	mV
`[lead]_rs_wave`	Magnitude of entire QRS complex = `[lead]_r_wave` + `abs([lead]_s_wave`	mV
`[lead]_rs_ratio`	Ratio of R wave to magnitude of entire QRS complex = `[lead]_r_wave` / `[lead]_rs_wave`	–
`[lead]_sr_ratio`	Ratio of S wave to magnitude of entire QRS complex = `[lead]_s_wave` / `[lead]_rs_wave`	–
`[lead]_t_max`	Maximum magnitude of T wave in `[lead]`	mV
`[lead]_t_max_loc`	Timing of T wave maximum (after QRS onset) in `[lead]`	ms
`[lead]_qrs_area`	Area of `[lead]` median beat QRS complex	mV·ms
`[lead]_t_area`	Area of `[lead]` median beat T wave	mV·ms
`[lead]_qrst_area`	Area of `[lead]` median beat full QRST complex	mV·ms
`cornell_lvh_mv`	Cornell LVH = `V3_s_wave` + `avL_r_wave`	mV
`sokolow_lvh_mv`	Sokolow-Lyon LVH = `V1_s_wave` + max(`V5_r_wave`, `V6_r_wave`)	mV
`qrs_frontal_axis`	Fontal plane QRS axis	deg