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LIST OF ABBREVIATIONS

Terms	**Abbreviation**
Digital Signal Processing	DSP
Data Acquisition Unit	DAQ
Electrical Capacitance Tomography	ECT
Electrical Inductance Tomography	EIT
Electrical Resistance Tomography	ERT
Electromagnetic Module	EM
Finite Element Software	FEM
Gallon per Minute	GPM
Gas Volume Fraction	GVF
Graphical User Interface	GUI
Giga Byte	GB
High Definition	HD
Industrial Tomography System	ITS
Litre per Minute	LPM
Linear Back Projection	LBP
Mega Byte	MB
Multi Modal Tomography Configurator	MMTC
Nuclear Magnetic Resonance	NMR
Process and Instrumentation Diagram	P&ID
Processing and Communication Card	PCC
Particle Image Velocimetry	PIV
Poly Vinyl Chloride	PVC
Signal to Noise Ratio	SNR
Two Dimensional	2D
Universal Serial Bus	USB
Universiti Teknologi PETRONAS	UTP

NOMENCLATURES

A	: Cross-sectional area of the pipe, m^2
A_g	: Area occupied by gas, m^2
A_j	: Area of the jth pixel
A_l	: Area occupied by liquid, m^2
A_{plate}	: Area of the capacitive plate, m^2
c	: Concentration of two-phase flow
C	: Capacitance, Farad (F)
C_h	: Measured capacitance when the sensor fully filled with high permittivity material
C_k	: Electrode pair capacitances when the sensor is full of the higher permittivity material
C_l	: Measured capacitance when the sensor fully filled with low permittivity material
C_m	: Measured capacitance of the mixture flowing through the pipe
C_n	: Set of normalised inter-electrode capacitances
C_0	: Distribution parameter/coefficient
C_{min}	: Lower capacitance value, Farad (F)
C_{max}	: Higher capacitance value, Farad (F)
d	: Spacing between the two plates, m
d_b	: Average bubble size, mm
D_i	: Inner diameter of the pipe/column, m
g	: Acceleration due to gravity, $m.sec^{-2}$
G	: Mass flux, $kg.m^{-2}sec$
$G(p)$	: Fraction of high permittivity material present at pixel p
h	: Distance between the tappings, m
K_1	: Electrodes length between adjacent electrodes

K_2	: Electrodes length between opposite electrodes, m
l	: Length of electrodes
L_g	: Length of driven guard electrodes, m
L_m	: Length of measurement electrode, m
L_t	: Total electrode length, m
L_{min}	: Minimum length of electrodes, m
L_{max}	: Maximum length of electrodes, m
M	: Inter-electrode capacitance measurements
n	: Normal unit vector along Γ
n_b	: Average number of bubbles in a column
N	: Number of electrodes
P	: Number of pixels
P_{i}	: Normalised value of the ith pixel
P_{k}	: Normalised value of the ith pixel when the sensor is completely filled with the higher permittivity material
Q	: Charge, Coulomb (C)
Q_g	: Gas volumetric flowrate, $\mathrm{m}^3.\mathrm{sec}^{-1}$
Q_T	: Total volumetric flowrate, $\mathrm{m}^3.\mathrm{sec}^{-1}$
Q_w	: Water volumetric flowrate, $\mathrm{m}^3.\mathrm{sec}^{-1}$
r	: Radius of bubble
Re	: Reynolds number
$S_{ij}(p)$	: Sensitivity map of electrode pair i-j at p^{th} pixel
U_{sg}	: Superficial gas velocity, $\mathrm{m.sec}^{-1}$
U_{sl}	: Superficial liquid velocity, $\mathrm{m.sec}^{-1}$
V	: Potential difference between the electrodes, V
V_G	: Actual gas velocity, $\mathrm{m.sec}^{-1}$
V_g	: Volume of gas, m^3
V_l	: Volume of liquid, m^3
V_{gj}	: Drift velocity of gas, $\mathrm{m.sec}^{-1}$
V_M	: Multiphase mixture velocity, $\mathrm{m.sec}^{-1}$

V_T	: Total volume, m^3
Δp	: Difference of static pressure between two sensors placed at a distance *h*

Greek Symbols

α_{gas}	: Gas volume fraction
α_{liquid}	: Liquid volume fraction
ε_0	: Permittivity of free space, $pF.m^{-1}$
ε_r	: Relative dielectric permittivity of a material
ε_h	: Higher permittivity
ε_l	: Lower permittivity
ε_m	: Permittivity of measured material
$\varepsilon(x,y)$	: Electrical permittivity distribution
$\varphi(x,y)$	: Electrical potential distribution
$\rho(x,y)$	: Charge distribution
λ	: Fraction of high permittivity object using the parallel model
ζ	: Fraction of high permittivity object using the series model
ϕ	:Fraction of high permittivity object using the maxwell model
θ	: Angle of the pipe
λ_{ij}	: Normalised capaictance for electrode pair *i-j*
λ_g	: Gas void fraction
λ_l	: Liquid holdup
σ	: Surface tension, $N.m^{-1}$
ρ	: Density, $kg.m^{-3}$
τ_W	: Wall shear stress
μ	: Dynamic viscosity, $Ns.m^{-2}$
Γ	: Closed curve surrounding the detecting electrode
Δ	: Difference

Subscripts

g	: Gas
ij	: Electrode Pair
l	: Liquid