RESEARCH ARTICLE OPEN ACCESS

Total Monomeric Anthocyanin and Total Flavonoid Content of Processed Purple Potato

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Abstract

It is well known that processing change physical and chemical composition of foods, thus affecting the content in bioactive substances. Potatoes are almost always consumed after processing (baked, fried or boiled) making it critical to understand the effect of such processing techniques on the containing in bioactive compounds. In order to determine the influence of processing on the content of anthocyanin pigments and flavonoids was achieved the extraction of these compounds from boiled and baked purple potato tuber (Albastru-Violet de Galanesti variety). Also, in order to obtain the maximum amount of anthocyanin pigments and flavonoids from processed potatoes was applied ultrasonic extraction (20 kHz) and was performed the mathematical modeling (central composite design) using SigmaXL software. The total anthocyanins content were determined spectrophotometrically by the pH differential method and the total flavonoids content were determine colorimetric by AlCl3 method. This study proves that the potato processing decreases the content of anthocyanin pigments and flavonoids.

Keywords: purple potato, anthocyanin pigments, flavonoid, processed potato

I. Introduction

Potato is the fourth food culture of the world, after corn, wheat and rice, with a production of 329 million tones per year. Worldwide, in terms of harvested area potato ranks seven after wheat, rice, corn, barley, sorghum and rapeseed. In terms of consumption, potato ranks third after rice and wheat. In Romania, currently, from the total cultivated area of 8.9 million hectares, potato ranks third with a share of about 3.2% after cereals which represent 62% and oilseeds 15% (FAO 2012).

Potatoes are significant source of natural antioxidants and exhibit antioxidant activity as demonstrated in recent time by many authors. Studies have indicated that these phytochemicals have high free-radical scavenging activity, which helps to reduce the risk of chronic diseases and age-related neuronal degeneration (Teow et al. 2007). Genotypes of potato with peel and pulp intensely colored (red, purple, blue) have antioxidant capacity 2-3 times higher than the white / yellow genotypes, and these aliments could help to supplement the required daily doses of antioxidants in the diet (Damsa et al. 2015). As a result, in recent years, breeder's efforts intensified to get new potato genotypes in different versions: blue peel and pulp (Kosieradzka et al. 2004, Nara et al. 2006).

It is well known that processing changes the physical and chemical composition of foods (Spanos et al. 1990; Price et al. 1997), thus, affecting their antioxidant activity (Nicoli et al. 1999; Dewanto et al. 2002). Potatoes are almost always consumed after processing (baked, chipped, fried, boiled or microwaved) making it critical to understand the effect of such processing techniques on the activity and composition of bioactive compounds in potatoes.

Some authors (Dao and Friedman 1992) reported a 100% loss in the chlorogenic acid content of potatoes baked at 212°C for 45 minutes, which suggested that chlorogenic acid is susceptible to heat. Baking led to an increase in the total phenolic content and antioxidant activity of eight potato genotypes. Samples had greater levels of chlorogenic acid, caffeic acid, *para*-coumaric acid and vanillic acid (Blessington et al. 2010). Baking for 30 minutes increased the total phenolic content and chlorogenic acid content in three potato genotypes. This increase could be due to improvement in the extractability of phenolic compounds as cooking weakens the matrix, and inactivates enzymes that use phenolic compounds as substrate (Ezekiel et al. 2011). The effects of baking cannot be generalized for all potato clones as they differ depending on potato genotype. Researchers found that boiling for 20 minutes did not alter the phenolic acid content but significantly

decreased the anthocyanin content of colored-flesh cultivars (Mulinacci et al. 2008). Researchers reported that boiling for 18 minutes caused an increase in the total phenolic content and chlorogenic acid content in two white-fleshed and one purple-fleshed potato genotypes (Navarre et al. 2010). Boiled samples had greater levels of chlorogenic acid, caffeic acid and vanillic acid (Blessington et al. 2010). A possible reason suggested was the increase in the extractability of phenolic compounds from cooked samples, similar to the observations for baked potato samples.

The optimisation of the extraction of anthocyanins and flavonoids is essential to reach an accurate analysis (Alberti et al. 2013). Response surface methodology (RSM) is an effective tool for optimizing this process. Also, this is a method for improving and optimizing processes, and it can evaluate the effect of the variables and their interactions (Farris and Piergiovanni 2009, Wettasinghe and Shahidi, 1999).

The main objective of this paper was to determine the influence of processing technique on the content of anthocyanin pigments and flavonoids.

II. Materials and methods

2.1. Plant materials

The potato variety, Albastru-Violet de Gălăneşti, a population found in Romania (Morar et al. 2004), was analysed after harvest from the research field of National Institute of Research and Development for Potato and Sugar Beet (NIRDPSB) Braşov, Romania.

2.2. Sample preparation

Purple potato in amount of 4 g (± 0.02 g) was homogenized in 40 ml of 1% acidified water. The extraction was achieved from fresh, baked and boiled purple potato tuber. The sample was treated with ultrasonic waves (UP400S, Hielscher USA, Inc) using an ultrasonic probe with a 1.3 cm diameter cylindrical titanium alloy head operated at 20 kHz and 750 W (Fig. 1). The tip of the probe was placed at 2 cm below the sample mixture and treated following each condition presented in Table 1. After the ultrasonic treatment, the sample mixture was centrifuged (10000 rpm, 15 min) and concentrated at 45°C. All the experiments were conducted in triplicate, the results are expressed as mean value ± standard deviation and for significant difference on $p < 0.05$.

Ultrasonic generator is equipped with a thermocouple and the temperature was set at 40°C to prevent overheating and consequently sample degradation.

Fig. 1. Experimental setup for sonication

Table 1. Conditions applied for anthocyanins and flavonoids extraction from purple potato tuber

Sample	1	2	3	4	5	6	7	8	9
Amplitude (%)	20			50			80		
Frequency (kHz)	20								
Time (min)	5	15	25	5	15	25	5	15	25

2.3. Determination of total monomeric anthocyanin content

The total monomeric anthocyanins content (TAC) were determined through pH differential method (Giusti et al., 2007) based on the property of anthocyanin pigments to change the color with pH. Two dilutions of the same sample were prepared, the first one in potassium chloride buffer (0.025 M, pH 1.0) and the second one in sodium acetate buffer (0.4 M, pH 4.5), pH being adjusted with HCl 0.2N. After equilibration at room temperature for 15 min, the absorbance of two dilutions was read at 510 nm and 700 nm using a UV-Vis Microplate Readers (Sunrise-Basic Tecan, Switzerland). Total monomeric anthocyanins - mg cyanidin 3-galactoside (cy-3-glu) equivalent / 100 g Fresh Weight - were calculated as follows:

$$TAC(mg/L) = (A \cdot MW \cdot DF \cdot V \cdot 100)/\varepsilon \cdot L \cdot Wt \quad (1)$$

$$A = (A_{510nm} - A_{700nm})_{pH=1} - (A_{510nm} - A_{700nm})_{pH=4.5} \quad (2)$$

The semnifications of symbols used in these relations are:

A – Absorbance

ε – Molar extinction coefficient (34300 $L/mol \cdot cm$ for cy-3-glu)

L – Path length

MW – Molecular weight (484.84 g/mol for cy-3-glu)

DF – Dilution factor

V – Volume

W_t – sample weight

2.4. Determination of total flavonoid content

The total flavonoid content (TFC) of purple potato extracts was determined by a colorimetric method as described previously in other studies (Kim et al., 2003; Zhishen et al., 1999).

The extracts were diluted with 2 ml of distilled water and 150 µl 5% $NaNO_2$ was added. After 6 min the mixture was treated with 150 µl $AlCl_3$ 10% and, after 6 min, with 2 ml NaOH 1N and the volume were made to 5 ml. The absorbance was measured at 510 nm using a spectrophotometer (DR2800, Hach, USA) and the flavonoid content was expressed as mg of quercetine equivalents for 100 g of Fresh Weigh (FW).

For building the calibration curve, quercetine is used as a standard materials. Various concentrations (Table 2) of standard quercetine solution were used to make a standard calibration curve (Figure 2).

Concentration values of extracts were obtained from quercetine standard curve, by interpolating to the X-axis. TFC was calculated by using the following formula:

$$TFC = (R \cdot DF \cdot V \cdot 100)/W \quad (3)$$

The semnifications of symbols used in this relation are:

R - Result obtained from the standard curve;
DF - Dilution factor;
V – Volume;
W – Sample weight.

Table 2 Absorbance at 510nm of different concentration of quercetine

Concentration (mg/ml)	Absorbance (510nm)
0.005	0.065
0.01	0.125
0.02	0.231
0.025	0.274
0.03	0.322
0.04	0.436
0.05	0.547

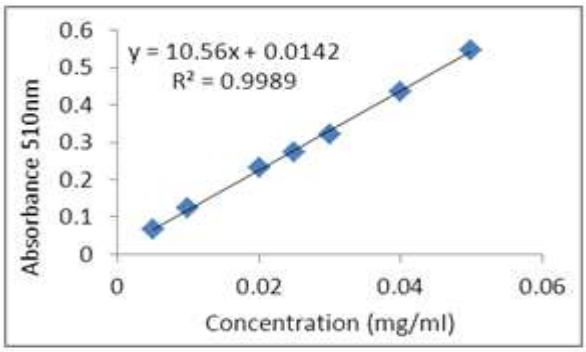

Fig. 2 Calibration curve of quercetine

2.5. Central composite design for the extraction of anthocyanins and flavonoids

Central composite design (CCD) with three-level and two-factor (Table 3) was design and created using SigmaXL statistical analysis software (Econotron Software Inc., Canada) to cover the range of investigated ultrasonic treatment time and amplitude. Sonication time and sonication amplitude were chosen as independent variables and the total flavonoid content (TFC) and total monomeric anthocyanins (TAC) were the responses of the design.

Table 3. Levels in central composite design

Factor	Level 1	Level 2	Level 3
A: Amplitude (%)	5	15	25
τ: Sonication time (min)	20	50	80

A second-order polynomial equation was used to fit the experimental data of the studied variables. The generalized second-order polynomial model used in the response surface analysis is shown in equation 4.

$$Y=\beta_0 + \beta_1 A + \beta_2 \tau + \beta_{11} A^2 + \beta_{22} \tau^2 + \beta_{12} A\tau \quad (4)$$

The semnifications of symbols used in this formula are:

Y – Response design (TFC or TAC);
β_0 – Intercept term;
β_1 and β_2 – Linear coefficients;
β_{12} – Interaction coefficients;
β_{11} and β_{22} – Quadratic coefficients;
τ and A – Independent variables (sonication time and amplitude).

The statistical significance of the terms in the regression equations was examined by ANOVA for each response. The terms statistically found as non-significant were excluded from the initial model and the experimental data were re-fitted only to the significant ($p < 0.05$) parameters.

III. Results and discussions

3.1. Optimization of sonication time and amplitude for TAC extraction from baked and boiled purple potato tuber

The mean values of the total anthocyanins

content of the extraction performed on purple potato tuber with 1% acidified water are shown in Table 4. The total anthocyanins content ranged from 72.67 mg/100g (run number 4) to 150.863 mg/100g (run number 1) for baked potato and from 85.626 mg/100g (run number 4) to 164.619 mg/100g (run number 1). The highest values for TAC of 164.619 mg cy-3-glu/100 g FW was obtained at 20% amplitude from boiled potato tuber using 1% acidified water, which was higher than the maximum TAC of 150.863 mg cy-3-glu /100 g FW obtained from baked potato tuber using 1% acidified water at the same amplitude and sonication time of 5 min.

The multiple regression analysis of total anthocyanins content values from baked potato showed that the model was significant ($p<0.0001$), did not present lack of fit ($p=0.39$) and it could explain 96.92% of all variance ($R^2_{adj}=0.96$). The predicted model can be described by the equation 5. Interactions coefficient of time (τ) and amplitude (A) increased the anthocyanins extraction, and time (τ), amplitude (A) and quadratic regression coefficient of time (τ) had a significantly negative effect.

$$TAC_C = 118.626 - 18.025A - 23.909\tau + 8.61125A\tau - 16.599\tau^2 \quad (5)$$

The result suggested that the quadratic regression coefficient of amplitude had negligible effects on the extraction of anthocyanins from baked potato.

The multiple regression analysis of total anthocyanins content values from boiled potato showed that the model was significant ($p<0.0003$), did not present lack of fit ($p=0.51$) and it could explain 95.77% of all variance ($R^2_{adj}=0.95$). The predicted model can be described by the equation 6. Interactions coefficient of time (τ) and amplitude (A) increased the anthocyanins extraction, and time (τ), amplitude (A) and quadratic regression coefficient of time (τ) had a significantly negative effect.

$$TAC_F = 125.144 - 18.6A - 20.808\tau + 9.694A\tau - 11.474\tau^2 \quad (6)$$

The models are well fitted with multiple regression equations for both processed technique: baked (TAC_C) and boiled (TAC_F), observed in the response surface analysis obtained (Fig. 3).

Table 4. Effect of sonication time and amplitude on TAC extraction from processed purple potato tuber using central composite design

Run order	τ (min)	A (%)	TAC (mg cy-3-glu/100 g FW)				Residuals for baked	Residuals for boiled
			Experimental values		Predicted values			
			Baked	Boiled	Baked	Boiled		
1*	5	20	**150.863**	**164.619**	152.57	162.77	-1.709	1.847
2	5	80	102.846	111.457	99.299	106.18	3.547	5.274
3	25	20	86.242	100.012	87.532	101.77	-1.290	-1.757
4	25	80	72.67	85.626	68.704	83.956	3.966	1.670
5	15	20	142.862	147.815	136.65	143.74	6.211	4.071
6	15	80	96.299	103.761	100.60	106.54	-4.301	-2.783
7	5	50	124.098	127.357	125.94	134.48	-1.838	-7.121
8	25	50	75.442	92.949	78.118	92.862	-2.676	0.087
9	15	50	115.668	127.357	118.63	125.14	-2.957	2.213
10	15	50	119.673	121.643	118.63	125.14	1.048	-3.501

* Optimum conditions for TAC extraction from baked and boiled potato tuber.

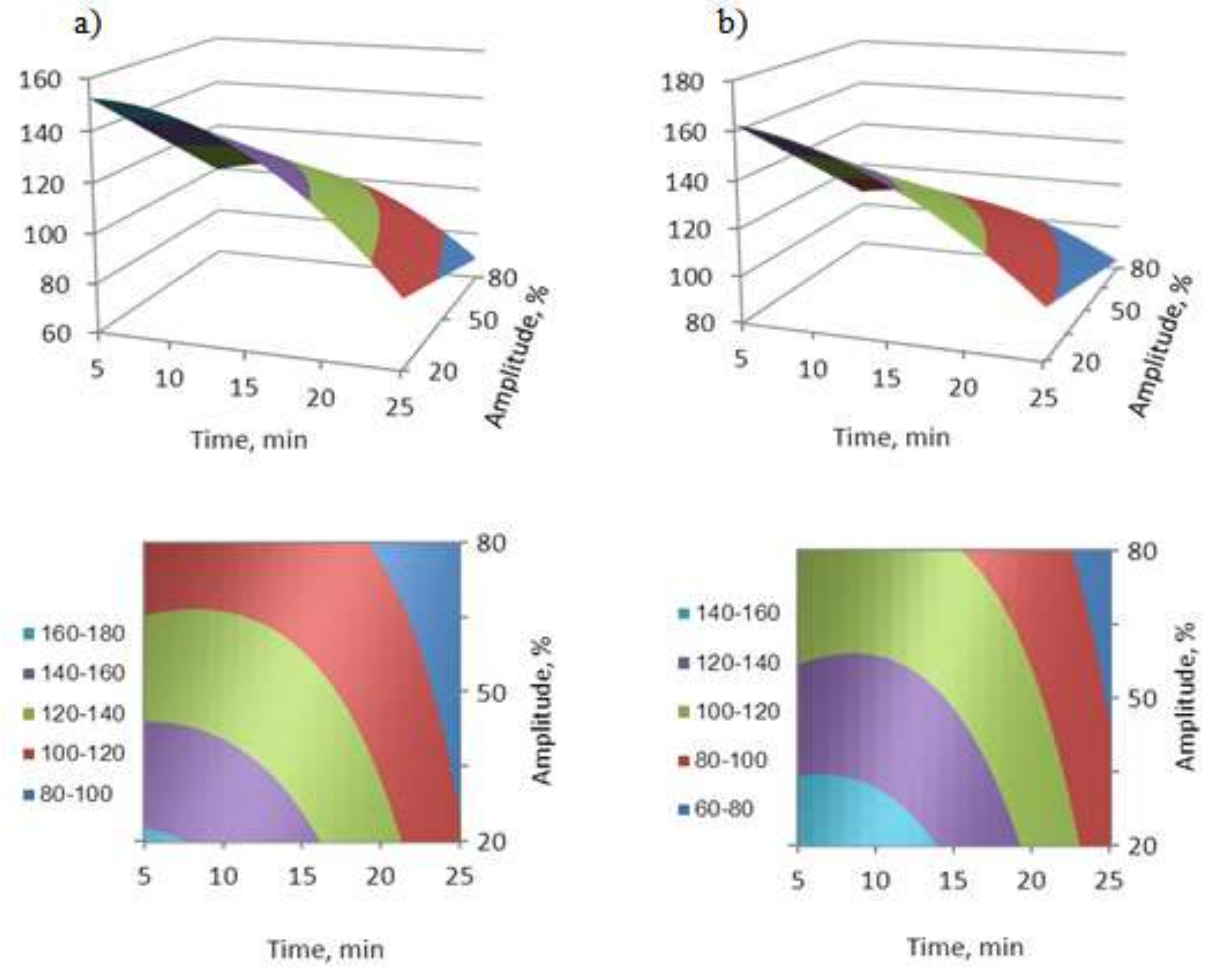

Fig. 3. Response contour plot and surface plot showing the effect of sonication time - τ (min) and amplitude - A (%) on TAC extraction from purple potato tuber: a) baked potato tuber, b) boiled potato tuber.

The optimisation procedure was conducted in order to maximise the total anthocyanins content. Through this models was found that the maximum anthocyanins content was obtained at amplitude of 20% and sonication time of 5.20 min for baked potato (152.579 mg cy-3-glu/100 g FW) and, for boiled potato, at amplitude of 20% and sonication time of 1.71 min (164.015 mg cy-3-glu/100 g FW).

3.2. Optimization of sonication time and amplitude for TFC extraction from baked and boiled purple potato tuber

The mean values of the total flavonoids content of the extraction performed on purple potato tuber with 1% acidified water are shown in Table 5. The total flavonoids content ranged from 97.499 mg/100g (run number 4) to 162.852 mg/100g (run number 8) for baked potato and from 98.243 mg/100g (run number 4) to 179.886 mg/100g (run number 8). The highest values for TFC of 179.886 mg cy-3-glu/100 g FW was obtained at 20% amplitude from boiled potato tuber using 1% acidified water, which was higher than the maximum TFC of 162.852 mg cy-3-glu /100 g FW obtained from baked potato tuber using 1% acidified water at the same amplitude and sonication time of 15 min.

The multiple regression analysis of total flavonoids content values from baked potato showed that the model was significant ($p<0.0001$), did not present lack of fit ($p=0.36$) and it could explain 98.19% of all variance ($R^2_{adj}=0.98$). The predicted model can be described by the equation 7. Interactions coefficient of time (τ) and amplitude (A) increased the flavonoids extraction, and time (τ), amplitude (A) and quadratic regression coefficient of time (τ) had a significantly negative effect.

$$TFC_C = 146.692 – 12.005A – 10.876\tau + 3.811A\tau – 30.539\tau^2 \quad (7)$$

The result suggested that the quadratic regression coefficient of amplitude had negligible effects on the extraction of flavonoids from baked potato.

The multiple regression analysis of total flavonoids content values from boiled potato showed that the model was significant ($p<0.0001$), did not present lack of fit ($p=0.71$) and it could explain 98.93% of all variance ($R^2_{adj}=0.98$). The predicted

model can be described by the equation 8. Interactions coefficient of time (τ) and amplitude (A) increased the flavonoids extraction, and time (τ), amplitude (A) and quadratic regression coefficient of time (τ) had a significantly negative effect.

$$TFC_F = 164.698 - 13.794A - 10.131\tau + 4.136A\tau - 47.350\tau^2 \quad (8)$$

The models are well fitted with multiple regression equations for both processed technique: baked (TFC_C) and boiled (TFC_F), observed in the response surface analysis obtained (Fig. 4).

Table 5. Effect of sonication time and amplitude on TFC extraction from processed purple potato tuber using central composite design

Run order	τ (min)	A (%)	TFC (mg quercetin/100 g FW)				Residuals for baked	Residuals for boiled
			Experimental values		Predicted values			
			Baked	Boiled	Baked	Boiled		
1	5	20	142.483	143.164	142.84	145.41	-0.362	-2.245
2	25	50	105.884	108.336	105.28	107.22	0.607	1.118
3	15	50	145.058	168.224	146.69	164.70	-1.633	3.526
4	25	80	97.499	98.243	97.082	97.559	0.417	0.684
5	5	50	126.312	129.483	127.03	127.48	-0.717	2.004
6	25	20	112.447	115.074	113.47	116.88	-1.024	-1.802
7	5	80	112.293	109.789	111.21	109.55	1.079	0.241
8*	15	20	**162.852**	**179.886**	158.70	178.49	4.156	1.393
9	15	50	142.895	163.357	146.69	164.70	-3.796	-1.341
10	15	80	135.961	147.326	134.69	150.90	1.274	-3.578

* Optimum conditions for TFC extraction from baked and boiled potato tuber.

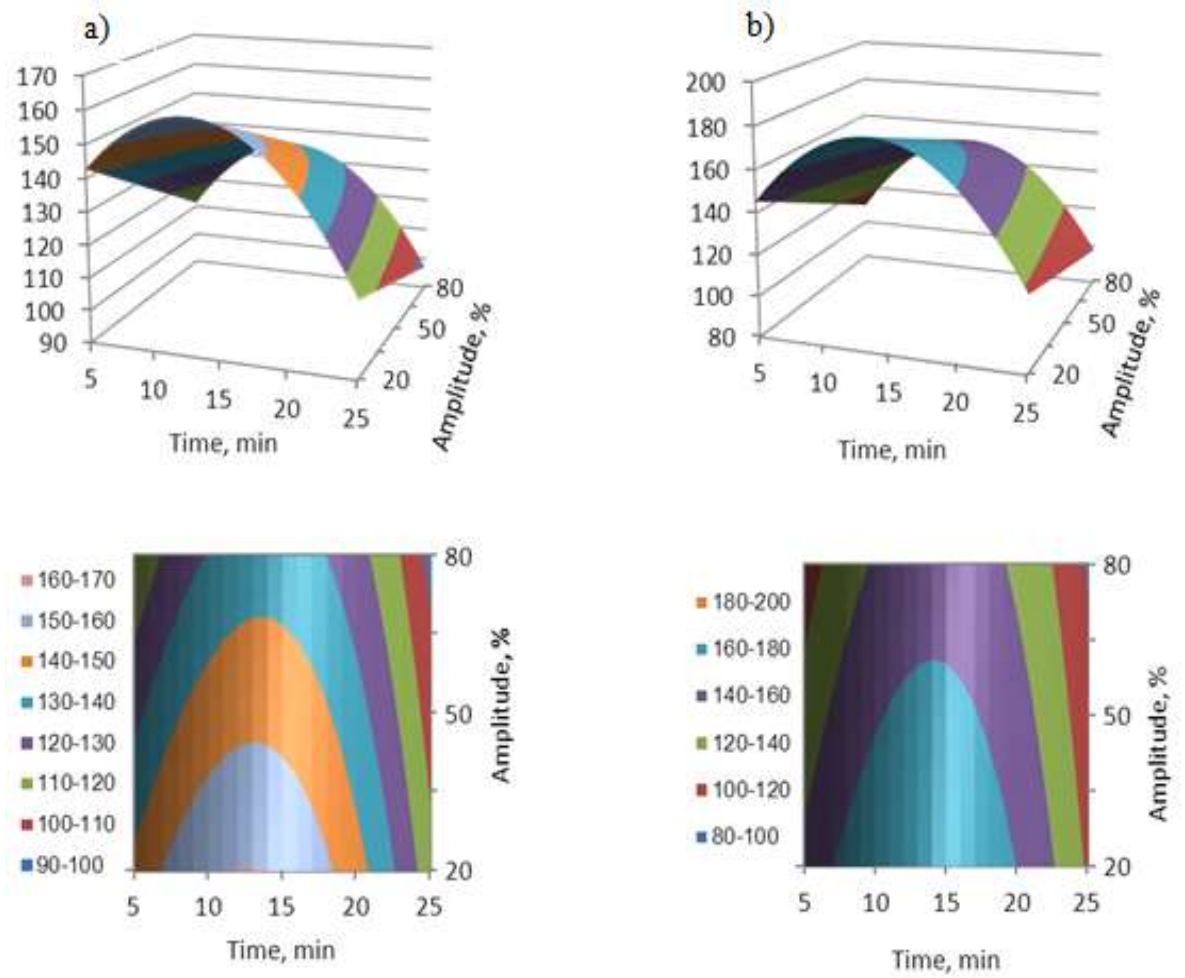

Fig. 4. Response contour plot and surface plot showing the effect of sonication time - τ (min) and amplitude - A (%) on TFC extraction from purple potato tuber: a) baked potato tuber, b) boiled potato tuber.

The optimization procedure was conducted in order to maximize the total flavonoids content. Through this models was found that the maximum flavonoids content was obtained at amplitude of 20% and sonication time of 12.60 min for baked potato (160.462 mg quercetine/100g FW) and, for boiled potato, at amplitude of 20% and sonication time of 13.49 min (179.567 mg quercetine/100g FW).

3.3. Comparison between extraction of anthocyanins and flavonoids from processed and fresh purple potato tubers

The results of ultrasound extraction from processed potato (amplitude 20% - optimum amplitude for anthocyanins and flavonoid extraction) were compared with the results of ultrasound extraction from fresh potato tuber (sample control).

The result from fresh potato for TAC was significantly higher than both processed technique (baked and boiled) (Fig. 5). For TAC extraction from baked potato was observed a significant decrease that range from 35.99% (sonication time of 15 min.) to 53.44% (sonication time of 25 min). Also, for TAC extraction from boiled potato was observed a significant decrease that range from 33.77% (sonication time of 15 min.) to 46.01% (sonication time of 25 min).

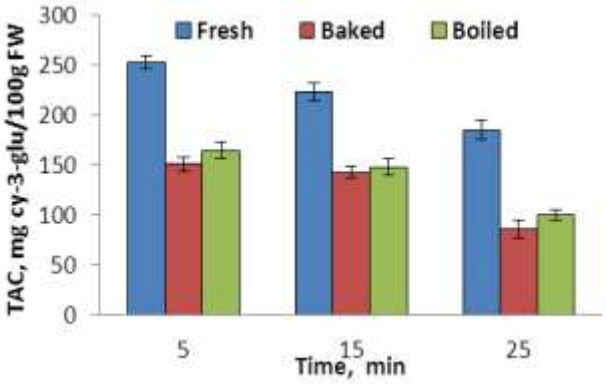

Fig. 5. Influence of processed technique on TAC extraction from potato tuber.

The result from fresh potato for TFC was significantly higher than both processed technique (baked and boiled) (Fig. 6). For TFC extraction from baked potato was observed a significant decrease that range from 21.52% (sonication time of 15 min.) to 33.59% (sonication time of 25 min). Also, for TFC extraction from boiled potato was observed a significant decrease that range from 13.31% (sonication time of 15 min.) to 32.04% (sonication time of 25 min).

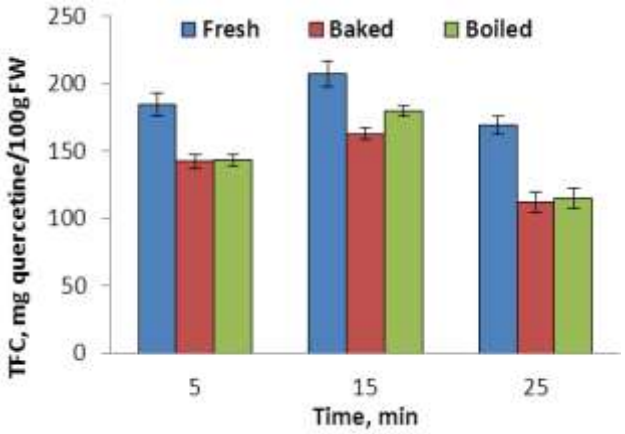

Fig. 6. Influence of processed technique on TFC extraction from potato tuber.

IV. Conclusions

CCD was effective in estimating the effect of two independent variables on the extraction of total anthocyanins and total flavonoids compounds in purple potato tuber. For TAC the best results was obtained at 20% amplitude and 5 min, and for TFC the best results was obtained at 20% amplitude and 15 min. Also, CCD was successfully used to obtain the optimum conditions for TAC and TFC.

For both processing methods was observed a significant decrease in the content of anthocyanins and flavonoids in processing potato.

V. Acknowledgement

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- Using Remote Sensing Techniques For Monitoring Ecological Changes In Lakes: Case Study Of Lake Naivasha
  Benjamin Ghansaha, David. M. Harperb, Eric. K. Forkuoa, Richard Appoh
  [Abstract] [PDF] [Cite]

  ### Abstract:

  The ability to use remote sensing in studying lake ecology lies in the capability of satellite sensors to measure the spectral reflectance of constituents in water bodies. This reflectance can be used to determine the concentration of the constituents of the water column through mathematical relationships. This work identified a simple linear equation for estimating suspended matter in Lake Naivasha with reflectance in Landsat7 ETM+ image. A R^2 = 0.94, n = 6 for suspended matter was obtained. Archive of Landsat imagery was used to produce maps of suspended matter concentrations in the lake. The suspended matter concentrations at five different locations in the lake over 30 year's period were then estimated. It was therefore concluded that the ecological changes Lake Naivasha is experiencing is the result of the high water abstraction and the effect of climate change.
  KEY WORDS: Archive, Changes in Climate, Ecology, Landsat Imagery, Lake Naivasha, Remote Sensing,

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  Benjamin Ghansaha, David. M. Harperb, Eric. K. Forkuoa, Richard Appoh, *"Using Remote Sensing Techniques For Monitoring Ecological Changes In Lakes: Case Study Of Lake Naivasha"*Vol. 6 - Issue 1 (January - 2016), International Journal of Engineering Research and Applications (IJERA) , ISSN: 2248-9622 , www.ijera.com

- Finite Element Simulation of Steel Plate Concrete Beams subjected to Shear
  C. H. Luu, Xin Nie, Feng Qin, Yue Yang, Y. L. Mo, Feng Fan
  [Abstract] [PDF] [Cite]

  ### Abstract:

  In a test series ofSteel plate Concrete (SC) beams conducted by the authorsto determine the minimum shear reinforcement ratio, complex structural behavior of the tested beams was observed, including shear cracking occurred within the concrete in the web and bond-slip failure of the bottom steel plate of the beam due to insufficient shear reinforcement ratio (Qin et al. 2015).This paper focuses on finite element simulation (FEM) of the SC beams withemphasis on shear and bond-slip behavior. A new constitutive model is proposed to account for the bond-slip behavior of steel plates. Also, the Cyclic Softened Membrane Model proposed by Hsu and Mo (2010)is utilized to simulate the shear behavior of concrete with embedded shear reinforcement.

Both constitutive models areimplemented into a finite element analysis program based on the framework of OpenSees (2013).The proposed FEM is able to capturethe behavior of the tested SC beams.

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- Climatic variability and spatial distribution of herbaceous fodders in the Sudanian zone of Benin (West Africa)
  Myrèse C. Ahoudji, B.S.C. Dan, Marcel R.B. Houinato, Jorgen Axelsen and A.B. Sinsin
  [Abstract] [PDF] [Cite]

Abstract:

This study focused on future spatial distributions of Andropogon gayanus, Loxodera ledermanii and Alysicarpus ovalifolius regarding bioclimatic variables in the Sudanian zone of Benin, particularly in the W Biosphere Reserve (WBR). These species were selected according to their importance for animals feed and the intensification of exploitation pressure induced change in their natural spatial distribution. Twenty (20) bioclimatic variables were tested and variables with high auto-correlation values were eliminated. Then, we retained seven climatic variables for the model. A MaxEnt (Maximum Entropy) method was used to identify all climatic factors which determined the spatial distribution of the three species. Spatial distribution showed for Andropogon gayanus, a regression of high area distribution in detriment of low and moderate areas. The same trend was observed for Loxodera ledermannii spatial distribution. For Alysicarpus ovalifolius, currently area with moderate and low distribution were the most represented but map showed in 2050 that area with high distribution increased. We can deduce that without bioclimatic variables, others factors such as: biotic interactions, dispersion constraints, anthropic pressure, human activities and another historic factor determined spatial distribution of species. Modeling techniques that require only presence data are therefore extremely valuable.
Keywords: Bioclimatic variables, Distribution, Fodders, MaxEnt, Model.

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- The Effect of Chitosan, Sorbitol, and Heating Temperature Bioplastic Solution on Mechanical Properties of Bioplastic from Durian Seed Starch *(Durio zibehinus*)
  M. Hendra S. Ginting, Maria Kristiani, Yunella Amelia, Rosdanelli Hasibuan
  [Abstract] [PDF] [Cite]

Abstract:

Nowadays, bioplastics is often researched to substitute the conventional plastics because bioplastics come from raw materials that is very enviromentally friendly and bioplastics is degradable. The purposes of this research are to know the characteristics of starch from durian seed and to know the effect of additional chitosan as filler, sorbitol as plasticizer, and variation of heating temperature bioplastic solution on mechanical properties of bioplastics. In process, the ratio between durian-seed starch and chitosan are 7:3, 8:2 and 9:1 gram, while the concentration of sorbitol are 20%, 30%, and 40%. The heating temperature of bioplastic solution is varied at 70 oC, 80 oC and 90 oC. Result of bioplastic FTIR shows there is increation of

wave number N-H from 1570.06 cm- 1 to 1589.34 cm-1 and O-H from 3352.28 cm-1 to 3653.18 cm-1. The characteristic of durian seed starch has water content 12.73%, ash content 0,51%, starch content 76,65%, amylose content 22.34%, amylopectin content 54.32%, protein content 11.61%, and fat content 0.61%. Optimum mechanical properties of bioplastic from durian seed starch occurs in heating temperature 70 oC with composition between durian-seed starch and chitosan is 7:3 grams and sorbitol 20.0 grams.
Keywords -starch, durian, chitosan, sorbitol, bioplastic

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M. Hendra S. Ginting, Maria Kristiani, Yunella Amelia, Rosdanelli Hasibuan, *"The Effect of Chitosan, Sorbitol, and Heating Temperature Bioplastic Solution on Mechanical Properties of Bioplastic from Durian Seed Starch (Durio zibehinus)"*Vol. 6 - Issue 1 (January - 2016), International Journal of Engineering Research and Applications (IJERA) , ISSN: 2248-9622 , www.ijera.com

- Crop Insurance, the Backbone of Indian farming community- Issues and Challenges
Mr Susil Kumar Sarangi, Dr Dibakar Panigrahi
[Abstract] [PDF] [Cite]

Abstract:

The dynamism of the farming sector, and its environment, is reflected in developments in the design of new insurance products. In the last decade two types of new products have been introduced. In some cases these have partially displaced existing covers; in others they have resulted in demand from new clients. Implementation of technology in farming usually involves investment. Such changes also frequently alter the risk profile of the enterprise. There are occasions when insurance can be a key component in a range of risk management strategies for the insurers. From an administrative point of view bank-insurer linkages make a lot of sense, since both these providers of financial services require similar client data.
This type of link, crop insurance and loans, is already very common, both in developing and developed agriculture. The vast, heavily subsidized scheme in India is largely linked to bank lending. So instead of the usual policy wording, such as indemnity, or range of indemnity levels, or a per hectare basis for a given crop, for losses from specific causes, the coupon merely gives a monetary sum which becomes payable on certification that the named weather event, of specified severity, has occurred. Again the role of state is very important making available crop insurance on a large scale, as they are public good in nature. Recently in Odisha, for crops such as Niger, cotton, red grams, jute, turmeric, ginger and banana, the farmers of selected blocks in some district could take advantage of the scheme. Because indemnity claim is settled only on the basis of yield data furnished by the State government. Hence the criteria that is based on requisite number of crop cutting experiments conducted under general crop estimation surveys should be supported by State to offer desired result in crop insurance.
Key Words: -Insurance Product, Banker-Insurance Linkage, Indemnity, Crop Estimation Survey

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- Framework for Bridges Maintenance in Egypt
Hesham Abd Elkhaleka, Sherif M. Hafezb, Yasser El Fahham
[Abstract] [PDF] [Cite]

Abstract:

The traditional approaches for bridges maintenance is proven to be inefficient as they lead to random way of spending maintenance budget and deteriorating bridge conditions. In many cases, maintenance activities are performed due to user complaints. The objective of this paper is to develop a practical and reliable framework to manage the maintenance and repair activities of Bridges network in Egypt considering performance and budget limits. The model solves an optimization problem that maximizes the average condition of the network given the limited budget using Genetic Algorithm (GA).
The main tasks of the system are bridge inventory, condition assessment, deterioration using markov model, and maintenance optimization. The developed model takes into account multiple parameters including serviceability requirements, budget allocation, element importance on structural safety and serviceability, bridge impact on network, and traffic. A questionnaire is conducted to complete the research scope. The proposed model is implemented in software, which provides a friendly user interface. The results of the framework are multi – year maintenance plan for the entire network for up to five years. A case study is presented for validating and testing the model with Data collected from "General Authority for Roads, Bridges and Land Transport" in Egypt.
Keywords –Bridge Maintenance, condition assessment, deterioration, cost optimization, fund allocation.

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- 3.4-3.9GHz Parallel Coupled Bandpass Filter with High Stopband Rejection and High Return Loss
Sheng-jun Lu, Yin-hua Yao
[Abstract] [PDF] [Cite]

Abstract:

This paper presents the design, fabrication, and measurement of 3.4-3.9 GHz parallel coupled microstrip bandpass filter. The EM simulation results indicate that the insertion loss varies between -1dB and -0.795dB at the desired frequency band. Both input and output VSWRs show the maximum value of 1.28. More than 40dB rejections out of band are witnessed at the stopbands of DC-2.7GHz and 4.85-7.45GHz. In contrast, the measured insertion loss is a little poorer, changing from -1.87dB to -2.59dB, and above 40dB suppression is also recorded at the same stopbands. A little higher input and output VSWRs, 1.415 and 1.404 are achieved in the fabricated filter. These results demonstrate that the developed filter can be applied in 3.4-3.9GHz communication systems.
Keywords -Stopband Rejection, Parallel Coupled Filter, Insertion Loss

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- Maximum PowerPoint Tracking of PV System Based on a Sepic Converter Using Fuzzy Logic Controller
Vrashali Jadhav, Dr. Ravindrakumar M.Nagarale
[Abstract] [PDF] [Cite]

Abstract:

This paper presents the MPPT (Maximum power point tracking) operation of PV (Photovoltaic) system based on a SEPIC (Single Ended Primary Inverter Converter) converter using fuzzy logic controller. MPPT method

such as Incremental conductance base on FLC (Fuzzy Logic Controller) is used to extract maximum output power of the PV system. PV energy is the most essential energy resources since it is pollution free, clean and endless. The FLC proposed scheme is interface with the MPPT to generate the PWM (Pulse Width Modulation) for the SEPIC controller for maximum power point tracking operation.FLChas used Mamdani's method for convergent and divergent of membership function. FLC is used for more efficient performance under the variation in different atmosphere. The fuzzy logic controller with SEPIC for MPPT scheme extract the maximum power point tracking without any change in the voltage at the inverter at different load condition. The behavior of the converter and controller tested in simulation at different operating conditions. Proposed scheme is used for accurately tracking maximum point and also send the smooth, error free signal to the inverter.

Keywords:DC-DC power converters, Fuzzy control, PV (photovoltaic) cells, MPPT (Maximum power Point

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- Trace Analysis of Driver Behavior on Traffic Violator by Using Big Data (Traffic Program) in Korea
  Lee, Jonghak
  [Abstract] [PDF] [Cite]

Abstract:

This study aims to prove the effectiveness of traffic safety education program for traffic violators. Traffic violators who finished the traffic safety education programs were tracked down. In order to analyze the effectiveness of traffic safety education program, traffic violator's data during ten-year period were used. This study analyzed how traffic violators changed their attitudes about traffic law abidance. Also predicted social benefits from traffic safety education program for traffic violators. Effectiveness of traffic accident prevention through traffic safety education program is approximately 93%. In terms of social benefits, it shows more than $12 billion Even though the effectiveness of traffic safety education program represents remarkable results, but this program is made for traffic violators who have already committed traffic offenses in the past. So in order to prevent traffic violations in advance, specific education program for potentially risky drivers is necessary.

Keywords -Traffic Safety Education Program, Traffic Violators, Traffic Accident, Social Benefits.

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- Seismic Microzonation Study in Tabriz Metropolitan City for Earthquake Risk Mitigation
  Ebad Ghanbari, Mohammad Ali Khorram
  [Abstract] [PDF] [Cite]

Abstract:

Azerbaijan is the site of convergent plate collisions along the Alpine-Himalayan active mountain belt. Brittle faults in the Azerbaijan area are mostly Cenozoic in or younger. The data presented demonstrate clearly that geological structures are commonly repeated at all scales from outcrop to regional. Several regional earthquakes have been strongly felt and caused damages in and around Tabriz during history. Urban seismic

risk is increasing with population growth and encroachment of vulnerable built in environment into areas susceptible seismic hazard. Seismic -hazard assessment an estimate of ground motion at the site of interest, taking into account instrumental and historical earthquake records, information on tectonics, geology, and attenuation characteristics of seismic waves Tabriz is important industrial city of Iran. It has a very high population density about 2.000000 people in area just 90 km2. The main objective of the Tabriz seismic instrumentation and microzonation study was to carry out and propose new building in Tabriz and suburbs in order to apply these criteria its development programs and determine the potential for damage to existing constructions during earthquake motions, and finally earthquake risk mitigation assessment.
Keywords: Seismic hazard, seismic microzonation, earthquake risk mitigation.

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- Total Monomeric Anthocyanin and Total Flavonoid Content of Processed Purple Potato
  Florentina Damşa, Alexandru Woinaroschy, Gheorghe Olteanu, Carmen Liliana Bădărău, Angela Mărculescu
  [Abstract] [PDF] [Cite]

Abstract:

It is well known that processing change physical and chemical composition of foods, thus affecting the content in bioactive substances. Potatoes are almost always consumed after processing (baked, fried or boiled) making it critical to understand the effect of such processing techniques on the containing in bioactive compounds. In order to determine the influence of processing on the content of anthocyanin pigments and flavonoids was achieved the extraction of these compounds from boiled and baked purple potato tuber (Albastru-Violet de Galanesti variety). Also, in order to obtain the maximum amount of anthocyanin pigments and flavonoids from processed potatoes was applied ultrasonic extraction (20 kHz) and was performed the mathematical modeling (central composite design) using SigmaXL software. The total anthocyanins content were determined spectrophotometrically by the pH differential method and the total flavonoids content were determine colorimetric by AlCl3 method. This study proves that the potato processing decreases the content of anthocyanin pigments and flavonoids.
Keywords:purple potato, anthocyanin pigments, flavonoid, processed potato

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Florentina Damşa, Alexandru Woinaroschy, Gheorghe Olteanu, Carmen Liliana Bădărău, Angela Mărculescu, *"Total Monomeric Anthocyanin and Total Flavonoid Content of Processed Purple Potato"*Vol. 6 - Issue 1 (January - 2016), International Journal of Engineering Research and Applications (IJERA) , ISSN: 2248-9622 , www.ijera.com

- Periodic material-based vibration isolation for satellites
  Xinnan Liu, WitartoWitarto, Xin Nie, Zhifei Shi and Y. L. Mo
  [Abstract] [PDF] [Cite]

Abstract:

The vibration environment of a satellite is very severe during launch. Isolating the satellitevibrations during launch will significantly enhance reliability and lifespan, and reduce the weight of satellite structure and manufacturing cost. Guided by the recent advances in solid-state physics research, a new type of satellite vibration isolator is proposed by usingperiodic material that is hence called periodic isolator. The periodic

isolator possesses a unique dynamic property, i.e., frequency band gaps. External vibrations with frequencies falling in the frequency band gaps of the periodic isolator are to be isolated. Using the elastodynamics and the Bloch-Floquet theorem, the frequency band gaps of periodic isolators are determined. A parametric study is conducted to provide guidelines for the design of periodic isolators. Based on these analytical results, a finite element model of a micro-satellite with a set of designed periodic isolators is built to show the feasibility of vibration isolation. The periodic isolator is found to be a multi-directional isolator that provides vibration isolation in the three directions.
Keywords:vibration isolation; periodic isolator; frequency band gaps

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Xinnan Liu, WitartoWitarto, Xin Nie, Zhifei Shi and Y. L. Mo, *"Periodic material-based vibration isolation for satellites"*Vol. 6 - Issue 1 (January - 2016), International Journal of Engineering Research and Applications (IJERA) , ISSN: 2248-9622 , www.ijera.com

- A Survey of provenance management in wireless sensor network
  Priyanka, M.Devika
  [Abstract] [PDF] [Cite]

Abstract:

Wireless Sensor Networks have great potential for numerous applications such as military target tracking and surveillance, natural disaster relief, health monitoring and hazardous environment exploration and seismic sensing. This paper describes the concepts of efficient mechanism of provenance in WSNs as provenance respresents a key factor in evaluating the trustworthiness of sensor data. Data in sensor networks is processed by the multiple agents; data provenance plays an important role for assuring data trustworthiness. Due to energy and bandwidth limitations of WSNs, it is crucial that data provenance for these networks be as compress as possibles. To address such issues, this paper explained various proposed technique.
Key words:provenance, sensor networks, trustworthiness.

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- Introduction to Mail Management System
  Suvarnsing G. Bhable, Jaypalsing N. Kayte
  [Abstract] [PDF] [Cite]

Abstract:

Developing different techniques to overcome this problem and protect the consumer, which planted in the hearts of trust people and encouraged them to purchase via the internet. At first you must know what is the main reason for the work of the filtration email the mail service is fast and easy way to exchange messages are singing from the use of traditional mail, there are a large number from of services in the internet requires that you have one email sometimes one of us would like to cancel his participation in one of the sites because of the large number of incoming messages to him from the site does not know and have for a way unsubscribe to get rid of these messages, or would like one of us that some of the messages is prohibited from specific people or locations for some of these problems has the following solution is the work of a filter to any e-mail and work ban for unwanted messages application spam filtering as a last resort, you can set up your own spam blocker with your email application's built-in filter capability Email filtering is the processing of

email to organize it according to specified criteria.
Keywords - WWW, IA, Internet, SI, Java, SQL

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- Comparison of Cell formation techniques in Cellular manufacturing using three cell formation algorithms
Prabhat Kumar Giri, Dr.S. K. Moulick
[Abstract] [PDF] [Cite]

Abstract:

In the present era of globalization and competitive market, cellular manufacturing has become a vital tool for meeting the challenges of improving productivity, which is the way to sustain growth. Getting best results of cellular manufacturing depends on the formation of the machine cells and part families. This paper examines advantages of ART method of cell formation over array based clustering algorithms, namely ROC-2 and DCA. The comparison and evaluation of the cell formation methods has been carried out in the study. The most appropriate approach is selected and used to form the cellular manufacturing system. The comparison and evaluation is done on the basis of performance measure as grouping efficiency and improvements over the existing cellular manufacturing system is presented.
Keywords -Neural Network, ART Model, Group Technology

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- Effect of Fines on Liquefaction Resistance in Fine Sand and Silty Sand
N.Silpa, Meraj Ahmad Khan, Dr M. Z. Khan, Mohd Bilal Khan
[Abstract] [PDF] [Cite]

Abstract:

It is required to recognize the conditions that exist in a soil deposit before an earthquake in order to identify liquefaction. Soil is basically an assemblage of many soil particles which stay in contact with many neighboring soil. The contact forces produced by the weight of the overlying particles holds individual soil particle in its place and provide strength. Occurrence of liquefaction is the result of rapid load application and break down of the loose and saturated sand and the loosely-packed individual soil particles tries to move into a denser configuration. However, there is not enough time for the pore-water of the soil to be squeezed out in case of earthquake. Instead, the water is trapped and prevents the soil particles from moving closer together. Thus, there is an increase in water pressure which reduces the contact forces between the individual soil particles causing softening and weakening of soil deposit. In extreme conditions, the soil particles may lose contact with each other due to the increased pore-water pressure. In such cases, the soil will have very little strength, and will behave more like a liquid than a solid - hence, the name "liquefaction".
Keywords -Liquefaction, Plasticity, Liquefaction Resistance, and Plastic fines etc

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N.Silpa, Meraj Ahmad Khan, Dr M. Z. Khan, Mohd Bilal Khan, *"Effect of Fines on Liquefaction Resistance in Fine Sand and Silty Sand"*Vol. 6 - Issue 1 (January - 2016), International Journal of Engineering Research and Applications (IJERA) , ISSN: 2248-9622 , www.ijera.com

- Power System Stability Enhancement Using FLC and MPC for STATCOM
Dr.A.Rajalingam, Dr.M.Ramkumar Prabhu & K.Venkateswara Rao
[Abstract] [PDF] [Cite]

Abstract:

In modern power system, Static Compensator (STATCOM) is used to alleviate the transient stability problem and damping power system oscillations. In this paper different STATCOM control scheme using fuzzy logic controller (FLC) and model predictive controller (MPC) for the Single Machine Infinite Bus (SMIB) system in improving transient stability is simulated using MATLAB/ Simulink in power systems block set. PI, FLC and MPC signals are used to control and exchange the required reactive power among the STATCOM and the power grid. A load disturbance is simulated and the behavior of the system for voltage fluctuations has been studied. Simulation results using Proportional-Integral (PI) controller, Fuzzy Logic Controller (FLC) and Model Predictive Controller (MPC) have been compared. The effectiveness of the different controllers in damping oscillations and improving power system stability has been discussed.
Keyword- Static Synchronous Compensator (STATCOM), PI controller, fuzzy logic controller (FLC), Model

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Dr.A.Rajalingam, Dr.M.Ramkumar Prabhu & K.Venkateswara Rao, *"Power System Stability Enhancement Using FLC and MPC for STATCOM"*Vol. 6 - Issue 1 (January - 2016), International Journal of Engineering Research and Applications (IJERA) , ISSN: 2248-9622 , www.ijera.com

- Finger Movement Based Wearable Communication & Navigation Aid for partially disabled
Jobin Jose, Kundan Joshi, Sreejih S, Dr.A.Thirugnanam
[Abstract] [PDF] [Cite]

Abstract:

The FMBWCN Aid is a portable and wearable multi-purpose system for the partially disabled. The Aid is a glove-based system in which different trained finger movements leads to different modes of operation of the system such as APR Voice Module and Wheelchair Controller Module. The finger movements (bending movement) leads to the flexion of the flex sensor attached to the glove. Flexion leads to change in resistance of the flex sensors, which will be recorded via a microcontroller (Arduino Uno) and different sets of movement of the fingers will lead to different modules of operation as specified in the default settings of the FMBWCN Aid.

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Jobin Jose, Kundan Joshi, Sreejih S, Dr.A.Thirugnanam , *"Finger Movement Based Wearable Communication & Navigation Aid for partially disabled"*Vol. 6 - Issue 1 (January - 2016), International Journal of Engineering Research and Applications (IJERA) , ISSN: 2248-9622 , www.ijera.com