

Patents for portable ECG devices with wireless

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Abstract

Introduction:

portable ECG devices with wireless are kind of telemedicine technologies and there are many patents for them. This study is about the lifecycle of these technologies and their patents.

Methodology:

Patents for portable ECG devices with wireless were searched in "Google Patent" and name of the patents and their publication date were extracted, then cumulative frequency of patents in periods of time was obtained and S-curve with Gompertz function of data was calculated to check the lifecycle of this technology.

Findings and Conclusion:

The technology has been growing slowly and now technology reaches the stage of maturity.

Keywords: *Telemedicine, patent, portable, ECG device, wireless*

1. Introduction

Telemedicine benefit perfectly healthy people by providing a wide range of general health assessments so that hospitals and clinics can use technologies for everything from patient care to administrative work and inventory management [1].

A portable ECG device with wireless can monitor remotely cardiac function of a patient, receive patient ECG data and transmit the patient ECG data to a centralized facility, such as a hospital.

In Department of Biomedical Eng of Amirkabir University of Technology of Tehran, Iran an portable ECG device with wireless project was implemented in the

form of master student thesis with supervising Associate Professor Dr.Mohammad Rabiee to monitor diabetic patient's heart[2-5].

There are many patents for portable ECG device with wireless.

A patent is a set of exclusive rights granted by a sovereign state to an inventor or assignee for a limited period of time in exchange for detailed public disclosure of an invention[6].

The shape of the technology lifecycle is often referred to as S-curve[7].The technology lifecycle is shown in Figure1.

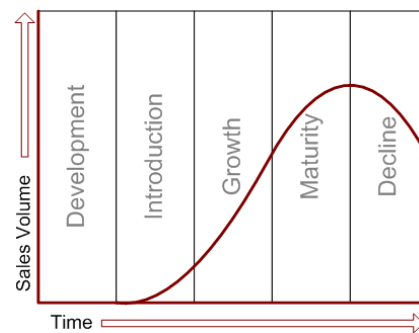


Figure1. technology lifecycle

If we obtain cumulative frequency of patents of an issue in periods of time then we can fit Gompertz function of data to check the status of technology in the future.

Curve fitting is the process of constructing a curve, or mathematical function, that has the best fit to a series of data points, possibly subject to constraints[8].

A Gompertz curve or Gompertz function is a type of mathematical model for a time series, where growth is slowest at the start and end of a time period. The right-hand or future value asymptote of the function is

approached much more gradually by the curve than the left-hand or lower valued asymptote, in contrast to the simple logistic function in which both asymptotes are approached by the curve symmetrically. It is a special case of the generalised logistic function[9].

2. Methodology

We performed an automated electronic search using the terms identified in Google Patent. At first, the terms were included the following: portable, ecg device, wireless and patent. 334000 results were found for any patent type in search tools. When utility type in patent type was set, 550 results were found. Search was narrowed with added telemedicine term to search keywords, 57 results were found.

Studies carried out until January 2014.

Patents and their publication date were extracted and cumulative frequency of patents in periods of time were obtained. S-curve with Gompertz Function of data to check the technology lifecycle was fitted and status of technology in the future was checked.

3. Findings

Investigated Patents in this study are as follows:

US8648717,US8630699,US8301232,US8577436,US8617081, US8568313,US8620591,US8285560,US8509882,US8036748, US8799010,US8515070,US8277377,US8352004,USRE42803, US8038614,US8221324,US8315695,US8092396,US7448753, US8043224,US8255238,US8108034,US7881762,US8038593, USRE43316,US8005686,US7179228,US7475019,US7623915, US7753845,US7534211,US7860725,US8027846,US6664893, US6804558,US6402,91,US6970737,US6443890,US6205716, US6363282,US6381484,US6290646,US6278999,US6292698, US6409661,US5865733,US5687717,US5724984,US5701904, US5640953,US5687734,US5579775,US5542420,US5305746, US4945410,US4216462

Chart of cumulative frequency of studied patents in periods of time is shown in Chart1.

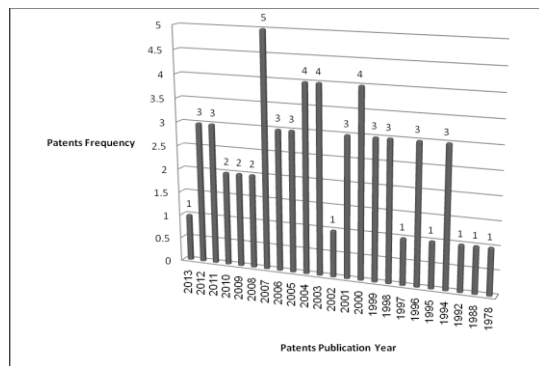


Chart1. cumulative frequency of studied patents in periods of time

Table of cumulative frequency of studied patents in periods of time is shown in Table1.

Year	Frequency
1978	1
1988	1
1992	1
1994	3
1995	1
1996	3
1997	1
1998	3
1999	3
2000	4
2001	3
2002	1
2003	4
2004	4
2005	3
2006	3
2007	5
2008	2
2009	2
2010	2
2011	3
2012	3
2013	1

Table1. cumulative frequency of studied patents in periods of time

We we fit a Gompertz curve to our data in MATLAB.

It is shown in Figure1 and Formuls are as follows:

```
>>decades=[1978,1988,1992,1994,1995,1996,1997,1998,1999,2000,2001,2002,2003,2004,2005,2006,2007,2008,2009,2010,2011,2012,2013]-1978;
>> pops=[1,1,1,3,1,3,1,3,3,4,3,1,4,4,3,3,5,2,2,2,3,3,1];
>> p0 = [0.1 2 2];
>> options=optimset('MaxFunEvals',10000,'MaxIter',5000);
>> [p,error]=lsqcurvefit(@gompertz,p0,decades,pops,[],[],options)
>>modelpops = gompertz(p,decades);
```

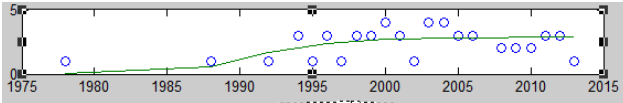


Figure 1. Gompertz Curve Fitting in MATLAB

4. Conclusions

The telemedicine technology, Portable ECG device with wireless, has been growing slowly and now the technology reaches the stage of maturity .

Aknowledgement



This study follows the implementation of master student thesis with supervising Associate Professor of Biomedical Eng of Amirkabir University of Technology, Dr Mohammad Rabiee to monitor diabetic patient's heart.



Special thanks to Associate Professor of Biomedical Eng of Amirkabir University of Technology, DR Mohammad Tafazzoli-Shadpour to teach technology management.

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