

# Social Networks for News Media Distribution

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## ABSTRACT

The connectivity and availability of the Internet enables truly grassroots networks to disseminate news at the personal level. In such an environment where news abounds and anyone can publish and distribute, a method is needed to filter the overwhelming quantity of information to locate news items that are relevant to the individual. Currently search engines are the primary method to locate online information, but they require a centralized database for querying and assume that searchers can specify their interests *a priori*. Traditional news media such as radio and television disseminate news to a generalized audience. These media fail to cater to an individual's particular interests and do not offer a wide variety of sources. In this paper, we propose an online system that employs a social network as an alternative means of news media distribution. A 'word-of-mouth' social network can be used to augment an individual's news-gathering capability by both locating more news than an individual could alone and filtering the news to supply only those items that are relevant to the individual. This method is a veritable news revolution where what constitutes news and its audience is dynamically and organically determined as individuals participate in the system.

## 1. INTRODUCTION

The purpose of a grassroots news media distribution system is to ensure that the news media generated and the news media distributed is free from the control of a top-down authority. Popular distribution mediums such as radio and television are the antithesis of grassroots media distribution. These technologies are structured in a top-down fashion due to their inherent limitations. Because of finite airtime and a small number of broadcast frequencies, the information generated and disseminated by television and radio is regulated by relatively few individuals.

With the advent of the Internet, came a decentralized form

of news media distribution. Any individual can produce and publish information on the World Wide Web (WWW) for any other individual to consume. Without restrictions on airtime or FCC regulations, Internet-based news media propagation has two major advantages. First, the WWW is a bottom-up means by which individuals can create and distribute information that is easily alterable and accessible at any time. Second, it is an unregulated medium that allows uncensored publishing. Due to the plethora of information available online, the definition of 'news' has become personalized. Individuals can locate those news media forums that best suit their tastes. The range of news sites currently supported by the WWW is vast: science news<sup>1</sup>, video gaming news<sup>2</sup>, local news<sup>3</sup>, political news<sup>4</sup>, children's news<sup>5</sup>, hunting news<sup>6</sup>, racist news<sup>7</sup>, anti-racist news<sup>8</sup>, etc. The range of potentially relevant topics to an individual are countless. The WWW is truly a grassroots media system because it abstains from regulating content and thus supports all personal values and beliefs. This form of grassroots media is generated in a bottom-up manner to support the uncensored distribution of information within a society.

Like the WWW, the Internet-based news distribution model proposed in this paper allows any individual to be a *creator* and *consumer* of news media. Also, like the WWW, the proposed system allows for the distribution of multiple media types, be it text, video, audio, still pictures, etc. However, unlike the pull-based model of the WWW, where users must actively locate pertinent information, news media is propagated through a collectively generated social network and thus, is a push-based peer-to-peer (p2p) news distribution medium [6]. The social network serves to propagate any individual's self-published 'news snippets'. Furthermore, the system capitalizes on popular tagging classification technol-

<sup>1</sup>Complexity Digest available at: <http://www.comdig.org>

<sup>2</sup>Internet Gaming News available at: <http://www.ign.com>

<sup>3</sup>The New Mexican available at: <http://www.santafenewmexican.com>

<sup>4</sup>BBC Politics available at: [http://news.bbc.co.uk/1/hi/uk\\_politics/default.stm](http://news.bbc.co.uk/1/hi/uk_politics/default.stm)

<sup>5</sup>Kids News Room available at: <http://www.kidsnewsroom.org>

<sup>6</sup>Fishing and Hunting news available at: <http://www.fishingandhuntingnews.com>

<sup>7</sup>Klu Klux Klan News available at: <http://ku-klux-klan-news.newslib.com/>

<sup>8</sup>The Anti-Racist Action Network available at: <http://www.antiracistaction.us/pn/>

ogy [5, 3]. Individuals are able to tag both their neighbors and traversing news snippets with self-generated keywords. These tags then provide a way to intelligently route information through the social network in order to ensure that the news received by an individual is relevant to his or her interests. The aggregation of news snippets on an individual's node in the social network forms the individual's personalized multi-media 'newspaper'. The proposed system is a bottom-up means for generating and distributing news media devoid of any authoritative definition of what should be classified as news.

## 2. MEDIA FORMS, DISTRIBUTION MEDIUMS, AND GENERAL DISTRIBUTION MODELS

News media, for the purposes of this paper, is defined as any type of information created for, and consumed by, an audience. There are three general forms of news media: text, audio, and video. A distribution medium is the means by which news media is distributed. Examples of text-based distribution mediums are newspapers and the WWW (i.e web pages). Audio media is distributed via the radio and the WWW (i.e mp3, real audio, etc.). Finally, video (which assumes audio integration) is distributed by means of television broadcasts and the WWW (i.e. mpeg, real video, etc.). The three news media forms and their distribution mediums are presented in Table 1.

media form	distribution medium
text	newspaper and www
audio	radio and www
video	television and www

Table 1: Media and their mediums

Notice that of the three news media forms, the WWW (by means of the Internet), is the only distribution medium that can propagate all media forms. Though television, in theory, can distribute text and pure audio, its use has been primarily that of a video-based medium.

There are two major arguments against the use of television and radio as the primary mechanisms for news media distribution. First, television and radio are limited in the amount of information they can effectively distribute. With limited bandwidth, the Federal Communications Commission (FCC) must regulate which individuals are able to broadcast and on which frequencies. This centralized regulation leads to the second major concern with television and radio as the sole means of distribution. With only a select group of individuals able to distribute media, the type of information distributed is biased towards the beliefs and values of those select few. That is, what is distributed as 'news' is determined by a select few.

These arguments are two of the main reasons why the WWW has received its unprecedented popularity in the last decade. The WWW embraces decentralized, bottom-up media gen-

eration and distribution. The difference between television/radio/newspaper and the WWW is found in their respective distribution models. Table 2 outlines the different distribution mediums and the distribution model that each represents. The final distribution model, peer-to-peer, is the form of this paper's proposed model.

distribution medium	distribution model
television, radio, newspaper	one-to-many
world wide web	many-to-many
proposed medium	peer-to-peer

Table 2: Distribution mediums and their models

The one-to-many distribution model states that there exists a single (or limited set) of media producers that distribute their news media to the population. For television and radio, this is the current state. A network representation of the one-to-many distribution model is presented in Figure 1 where the directed edge going from left to right states that the single node on the left is generating and distributing all the content being received by the nodes on the right.

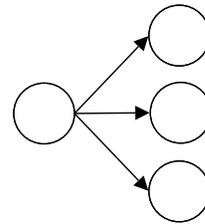


Figure 1: One-to-many distribution model

The WWW, with its open publication model due to unlimited bandwidth and negligible regulation, allows anyone to create and consume material. In this model, publishers (creators) and viewers (consumers) can be one and the same individual. This model is represented as a network in Figure 2 where every individual can disseminate their media to and receive their media from any other individual in the population.

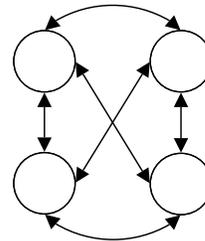


Figure 2: Many-to-many distribution model

One of the major limitations of the many-to-many model is also its greatest benefit. With the vast amount of news media created, locating which information is most applicable to the individual becomes difficult. For this reason, search engines, such as Google [2], have been developed to indicate

relevant sites to an individual searching for particular information. However, the search engine paradigm is limited in that an individual is required to know *a priori* the type of information, or news, in which he or she is interested. This form of media consumption is a *pull-based* model. Information exists and individuals must locate for themselves their desired information for consumption.

In order to provide the consumer with potentially useful information, *push-based* models of information propagation have been created. For instance, web-services such as Amazon.com<sup>9</sup> utilize recommender system technology to push potentially desired products on the consumer [4].

This paper’s proposed media distribution system utilizes a push-based information retrieval model. The proposed system allows the individual to subscribe to certain news creators. These subscriptions allow an individual to state from which news sources they desire their news. In a framework similar to that of recommender systems, the proposed system then ‘recommends’ or ‘pushes’ news media to the end consumer. A social network of subscriptions serves as the infrastructure which contextualizes the topics which would be most relevant to the individual. This distribution model can be called a peer-to-peer distribution model and is represented in Figure 3 where media information flows in a selective manner between individuals.

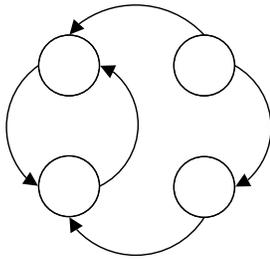


Figure 3: Peer-to-peer distribution model

A peer-to-peer media distribution model is favored over other methods for many reasons. First and foremost, unlike the one-to-many distribution model, in the peer-to-peer model, news media is no longer created by a single source (or a few sources), but instead can potentially be created by any individual in the system. That is, each participant can determine for themselves what is considered relevant news. Important news media may be scientific manuscripts, community updates, humorous image files, political propaganda, etc. What is deemed important news media for one individual, may not be deemed important for another. Also, any individual can publish news media that is relevant to their subjective understanding of important information. Other individuals choose to consume another’s published material or not. Therefore, to ensure a strict adherence to a grassroots model of news media distribution, the very concept of news in this system is decentralized and distributed amongst the community. There is no administrative control

<sup>9</sup>Amazon.com is available at: <http://www.amazon.com>

over what is deemed ‘newsworthy’.

### 3. PROPOSED P2P NEWS MEDIA DISTRIBUTION

This section will discuss the underlying technology that allows for the propagation of self-generated news media within a peer-to-peer distribution medium.

#### 3.1 Social Network Constructs

The communication channel for the news media propagation is a social network. A social network is a network that connects human individuals. For example, individual *A* can make a directed link to individual *B*. That is, *A* can state that they believe *B* would be interested in his or her flavor of media. Furthermore, *A* can desire news generated from individual *C*. Therefore, *A* can ‘force’ *C* to create a directed link from *C* to *A*. In this sense, *A* subscribes to information published by *C*. The individuals that provide outgoing edges are called news media *creators*. The individuals that receive incoming edges are called news media *consumers*. In Figure 4, *C* is *A*’s news creator and *B* is *A*’s news consumer. Furthermore, *A* is considered *B*’s news creator, and *C*’s news consumer. The definition of creator and consumer is dependent upon one’s location in the network.

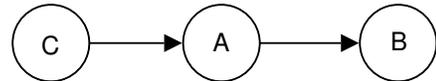


Figure 4: *A* as a news media creator and consumer

Given that humans have multiple interests and therefore create and consume multiple types of news media, it is important to label which type of information is desirable for consumption. Individual *B* may desire only to receive ‘science’ news from *A* while *A* may desire to receive ‘science’, ‘politics’, and ‘humor’ news from *C*. To represent this, the type of relationships made between individuals are labeled, or tagged, as presented in Figure 5. The tags are used to categorize link types and are derived using bottom-up folksonomy technology [5, 3].

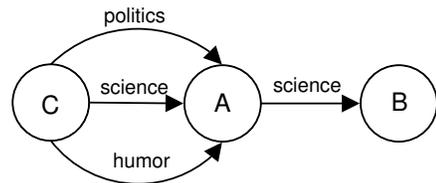


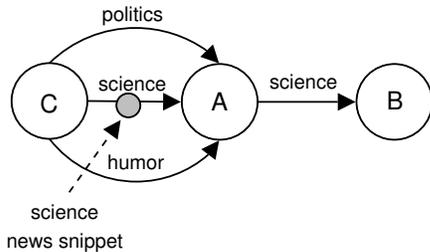
Figure 5: *A*’s tagged news media creator and consumer relationships

#### 3.2 Defining a News Snippet

A news snippet is a news media item that is created by an individual for distribution along the individual’s outgo-

ing links. A news snippet can contain text (i.e. html), images (i.e. jpg), audio (i.e. mp3), video (i.e. mpg), software (i.e. zip), or simply a reference to a URI (i.e. URL). A news snippet can be encoded using the popular MPEG-21 Digital Item Declaration Language (DIDL) XML standard for embedding byte streams or for referencing byte streams via a URI [1]. Furthermore, the DIDL standard allows an individual to attach associated metadata to the news snippet. Attached information may be the snippet’s original creator, chain of distributors, date of creation, etc. Most importantly, the metadata allows for an individual to tag, or categorize, the snippet. These tags determine over which edges the news snippet can propagate. As a side note, we will implement a way to ensure that this system does not promote copyright infringement.

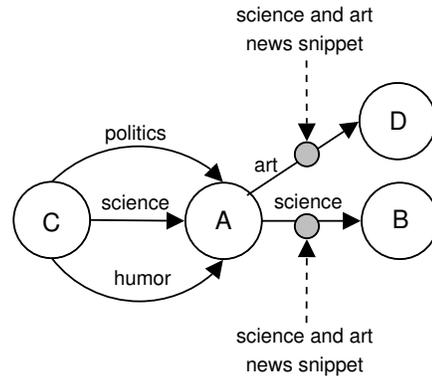
As demonstrated in Figure 6, news snippets that are tagged as ‘science’ will be able to propagate from *A* to *B* via the ‘science’ labeled edge. The news snippet (gray circle) is created by *C*, tagged by *C* as ‘science’, and therefore, is propagated to *A* via the ‘science’ labeled edge. The idea is that *A* is familiar with *C*’s meaning of ‘science’ and finds such ‘science’ information from *C* to be interesting.



**Figure 6: Propagating ‘science’ news snippets through the social network**

The lifespan of a news snippet is determined by its popularity. For instance, imagine if *C* created a ‘science’ news snippet. Given that *A* subscribes to *C*’s created ‘science’ news, *A* would receive *C*’s ‘science’ news snippet. If *A* does not like the news snippet, or does not deem it worthy of being propagated, then *B* will not receive *C*’s ‘science’ news snippet. However, if *A* finds the news interesting and therefore worthy of propagation, then *B* would receive the news snippet. Each individual is a creator through reinterpretation of news whether that news snippet was originally created by the individual or received from another source. Therefore, each individual controls the information he or she propagates through personal rating and further tagging of each news snippet, ensuring that individuals are providing their consumers with only the information they deem appropriate. Ratings and tags provide a filter and routing mechanism for the news snippets in the network. The step-by-step regulation is a way to control spamming. On the other hand, it can be seen as decentralized censorship. For instance, *A* can refuse to propagate all ‘science’ news from *C*. To thwart censorship, the news snippet can either take another path in the network to arrive at *B*, or *B* can directly subscribe to *C*’s ‘science’ stream and thus bypass *A*’s distribution step.

Furthermore, *A* may read the ‘science’ news snippet created by *C* and deem the snippet more ‘art’ than ‘science’ and thus manipulate the tags associated with the news snippet. According to Figure 8, if *A* removes the ‘science’ tag and tagged the news snippet ‘art’ then only *D* would receive the snippet. On the other hand, if *A* simply amends the tag ‘art’, then both *D* and *B* would get *C*’s news snippet now tagged as ‘art’ and ‘science’. This demonstrates how dynamic tagging facilitates subjective categorizations. Tagging can prove useful if *A* denoted all his or her consumer friends with a tag ‘myfriends’. In such cases, any news snippet that *A* deems all of his or her friends would enjoy can simply have the tag ‘myfriends’ added to the tag list. Note that the news snippet needs to copy, or clone, itself so that it may take all the appropriate edges allowed by its tags.



**Figure 7: Propagating multi-tagged news snippets through the social network**

Finally, given that news snippet propagation is controlled by each individual, news propagation can be delayed by those who do not read their incoming news snippets in a timely manner. To handle such situations, a snippet creator may propagate a snippet more than 1 step in the social network. That is, a creator may deem a news snippet so important that it propagates up to 3 steps from his or her node. For example, if *C* believed that his or her created ‘science’ news snippet was extremely important, then *C* can propagate the snippet 2 steps. *C* would supply *B* with a ‘science’ snippet even though *A* has not provided a seal of approval. It is important to limit the maximum number of steps that an individual can propagate a created news snippet in order to control spam behavior. The balance between what is considered censorship (or long delay times) and spam (or large distribution steps) will be determined during system design and initial testing.

### 3.3 Defining a Multimedia Newspaper

Every individual in the system has a personal multimedia newspaper. An individual’s newspaper can be thought of as a web-page that contains an aggregation of all the news snippets that have reached that individual’s node. Therefore, a newspaper is personalized according to the subscriptions of the individual. Furthermore, an individual’s subscription is defined recursively as all the subscriptions and ratings that preceded the individual from creator to end consumer.

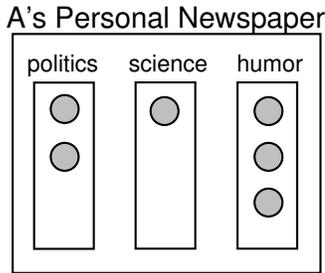


Figure 8: A's personal categorized newspaper

An individual can 'close' particular news snippets and thus clear his or her newspaper of material, much like deleting an email. The newspaper serves as the interface by which individuals rate particular news snippets. As discussed previously, positively rated news snippets continue to propagate while negatively rated news snippets are no longer propagated.

The newspaper interface can also serve as the means by which an individual creates novel news snippets. A page of the newspaper will provide an interface to upload files or input URI references, to initially tag the news snippet, and to set a desired number of steps to traverse (i.e. an integer from 1 to 3). Submitting this information will generate the news snippet and propagate it along the appropriate social network edges.

#### 4. IMPLEMENTATION SPECIFICS

There are multiple ways to implement this system. One way is to make the system a client-based program similar to the popular instant messaging client software<sup>10</sup>. An individual can add any number of consumers and creators and supply appropriate tags as desired. A central server can provide directory services for locating personal friends, highly rated news creators, etc. Furthermore, the client-based software will provide an interface for the individual's personal newspaper.

Another implementation can be purely web-based where a user logs into a web-service via a web-browser. After log-in, the user is directed to his or her personal newspaper and creator/consumer list. Much like the client-based method, creators and consumers can be tagged and a directory service can be provided.

There are pluses and minuses to both implementation styles. In the client-based software model, the system is completely distributed and can take on a flavor similar to that of Gnutella<sup>11</sup> and Freenet<sup>12</sup>. Unfortunately, for news snippets to propa-

<sup>10</sup>Wikipedia description of instant messaging available at: [http://en.wikipedia.org/wiki/Instant\\_messaging](http://en.wikipedia.org/wiki/Instant_messaging)

<sup>11</sup>Gnutella available at: <http://www.gnutella.com>

<sup>12</sup>Freenet available at: [freenet.sourceforge.net](http://freenet.sourceforge.net)

gate, clients must be online to maintain the peer-to-peer infrastructure. Therefore, offline clients can effect news snippet distribution.

On the other hand, the web-based model is not effected by non-active users. However, it is a centralized model in that all news snippets, personal newspapers, and social network information is stored on the web-service server. This may allow for deviant administrators to tamper with news distribution. Furthermore, this system costs money to maintain because a central hosting service is required. The implementation style will be determined during the design phase of the project.

#### 5. SYSTEM BENEFITS

The benefits of this news media distribution system are many. First, the proposed system allows people to determine what is important to them and their consumers without any top-down control of what is deemed appropriate. Therefore, the system is of public interest for the very reason that the public defines what interests them. Second, the system is media independent because any digital object can be propagated within the social network. Third, the system is scalable in that it can be implemented in a peer-to-peer fashion [6]. The system will only improve with scale as more users create and classify the news snippets propagating through the network. Fourth, the system is sustainable at an extremely low-cost. After initial development, the only cost will be to maintain a web hosting contract if that becomes the implementation model. Finally, the concepts driving this system are simple to implement and therefore can be adopted by existing social software services (i.e Smartocracy<sup>13</sup>, MySpace<sup>14</sup>, etc.). The benefits of this system are itemized below for ease of reference.

- of public interest by definition
- media independent in the sense that it can support any type of media
- scalable in that it is peer-to-peer and that news media generation is completely bottom-up
- sustainable in that after initial development the continued cost is minimal
- simple in that this idea can be easily implemented as a standard social software service

#### 6. CONCLUSION

Recently, current news has become readily available 24 hours a day. Many dedicated news channels offer a continuously streaming ticker under live reporting, analysis, and commenting lest the viewer miss any news items while other news is discussed. The WWW boasts even more news sources than television, often continuously updated. These innovations have served the public by making news current to the

<sup>13</sup>Smartocracy available at: <http://www.smartocracy.net>

<sup>14</sup>MySpace available at: <http://www.myspace.com>

minute, heterogeneous in topic, and specialized in content. They also have the capacity to bombard the individual with too much information. However, there has been little research concerning methods for filtering the news.

We as a society are perhaps still so enthralled with the possibilities of continuously available and updated news that we don't recognize the importance of selectively choosing where our attentions should lie. The notion of filtering news seems counter to our national desire for a free press and an uncensored society; however, filters do not have to be totalitarian or even top-down. A filter should be personalized and responsive to change. News media distribution systems such as that proposed in this paper create a distributed and dynamic newsgathering and filtering service to better pair a news item with an interested audience. Such a system does not impede, but enables participants to intelligently navigate the ever-expanding world of news items.

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